This is the published version of a paper published in *Entrepreneurship and Regional Development*.

Citation for the original published paper (version of record):

The geography of starts-ups in Sweden: The role of human capital, social capital and agglomeration
*Entrepreneurship and Regional Development*
https://doi.org/10.1080/08985626.2019.1565420

Access to the published version may require subscription.

N.B. When citing this work, cite the original published paper.

Permanent link to this version:
http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-158795
The geography of starts-ups in Sweden. The role of human capital, social capital and agglomeration

Rikard Eriksson & Marcin Rataj

To cite this article: Rikard Eriksson & Marcin Rataj (2019): The geography of starts-ups in Sweden. The role of human capital, social capital and agglomeration, Entrepreneurship & Regional Development, DOI: 10.1080/08985626.2019.1565420

To link to this article: https://doi.org/10.1080/08985626.2019.1565420

© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

Published online: 04 Feb 2019.

Article views: 456
The geography of starts-ups in Sweden. The role of human capital, social capital and agglomeration

Rikard Eriksson and Marcin Rataj
Department of Geography and Economic History, Umeå University, Umeå, Sweden

ABSTRACT
In academia as well as in policy circles, entrepreneurial activities are placed at the focal point for regional development. However, geographical factors such as urbanization and peripherality are often neglected in this strand of research despite the increasing need for place-specific policies. The aim of this paper is therefore to analyse how start-up rates vary across municipalities in Sweden 2002–2012 by focussing on spatial differences of human capital, social capital, entrepreneurial culture and industrial specialization. Our multi-level models show how the degree of rurality and peripherality, respectively, moderates the role of different regional resources. The paper concludes by suggesting the formulation of separate policies considering urban, rural and more peripheral regions.

ARTICLE HISTORY
Received 12 April 2016
Accepted 12 December 2018

KEYWORDS
Start-ups; entrepreneurship; multilevel analysis; human capital; social capital; entrepreneurial culture; urbanization; peripheries

Introduction
Previous research has established that entrepreneurship and regional development are interrelated. On the one hand, entrepreneurship is viewed as a vehicle of economic growth and a tool for diminishing labour market tensions (European Commission, 2013). On the other hand, factors crucial for regional development also shape opportunities to establish and develop enterprises (Unger et al. 2011). The missing piece in this puzzle is the geographic dimension. As emphasized by both Westlund, Larsson, and Olsson (2014) and Grek, Karlsson, and Klaesson (2011), geographical factors such as urbanization and peripherality are often neglected in this strand of research despite the increasing need for place-specific policies. Consequently, while there is a growing interest in relationships between formation of new companies and both human and social capital, there is still a need for a more geographically oriented analysis regarding what type of regional endowments matter and where they do so (Westlund, Larsson, and Olsson 2014).

Understanding such relationships is particularly important for the development of rural and peripheral regions. As emphasized by Eliasson and Westlund (2013), metropolitan and core regions are locations where multiple resources facilitating economic growth are abundant, while rural and peripheral regions tend to lack such resources. In this regard, it is imperative to understand not only what types of factors facilitate entrepreneurship, but also if different factors play different roles in different geographical contexts. Some studies suggest that the determinants of start-up formation are the same for urban and rural areas (Elert 2014; Eliasson and Westlund 2013), while others provide evidence that determinants might vary depending on geographic characteristics (Eliasson, Westlund, and Fölster 2013). The former findings indicate that in the context of entrepreneurship, no particular entrepreneurial policies for rural areas are advised, while the latter opt for the development of different local strategies. In this regard, the context-specific investigation of
factors facilitating start-up formation can help us understand the aspects in which entrepreneurial policies should take into account different regional characteristics.

The aim of this paper is therefore to analyse regional mechanisms behind start-up rates. We investigate the role of human factors on regional level for new firm formation and how it varies across municipalities in Sweden 2002–2012. The analysis focuses on formation of microenterprises, as their foundation is more likely to stem solely from local, individual resources rather than multinational investments (Donner and Escobari 2010; Mead and Liedholm 1998). We analyse this using multilevel models to explicitly account for the spatial setting in which new firms are established. This is made possible using data from a municipality-level (the most local administrative unit) database on human and social capital, as well as the industrial structure of the Swedish economy. This data has a hierarchical structure and includes multiple observations from the period 2002–2012 per municipality, with the municipalities nested within functional labour market regions (i.e. coherent commuting areas). To make the best use of this rich dataset, we employ three-level models that take into account the potential regional dependencies between municipalities.

The contribution to the literature is threefold. First, it provides evidence regarding the so-called soft and hard place-specific factors (i.e. social characteristics, structure and size of local economy, respectively) that promote formation of new companies. Second, it shows how the geographic context moderates the impact of both soft and hard factors on start-up rates. Thereby finding that the determinants of start-ups differ in space, going beyond strictly market-oriented drivers. Third, it provides evidence that effects related to rural and peripheral dimensions need to be distinguished in estimation procedures to capture aspects specific to these two geographical settings.

**Literature review and hypotheses**

There is large body of evidence indicating that rates of new firm formation tend to be quite persistent over time (Armington and Acs 2002). For example, Fritsch and Wyrwich (2014) show that, in the case of Western Germany, regional differences in entrepreneurship levels were stable for eight decades despite disruptive historical events. They argue that the explanation for this stable trend is that the changes in factors influencing entrepreneurial activities have an evolutionary character. Entrepreneurial literature also indicates that both soft factors (related directly to social characteristics such as level of human capital and social capital as well as the presence of entrepreneurial culture) and hard factors (concerning structure and size of local economy) should be considered when analysing regional entrepreneurial patterns (Armington and Acs 2002; Fritsch and Wyrwich 2014). Nevertheless, there is still a need for a more geographically oriented analysis concerning what type of regional endowments matter in specific geographic contexts (Westlund, Larsson, and Olsson 2014). Therefore, in the following sections we present the key findings regarding the role of soft and hard factors in start-ups formation process and analyse their role in the context of relative peripherality and agglomeration.

**Human capital and opportunity-driven entrepreneurship**

An important regional factor shaping entrepreneurial patterns is a level of regional human capital. In general, entrepreneurs that are more educated tend to be located where a more educated workforce already is located and such locations tend to enjoy higher start-up rates (Parker 2018). There is a number of reasons for this relationship. Rauch (1993), for example, argues that the average level of human capital is a local public good and the empirical research in economic geography shows that the human capital accumulated in regions might have positive external effects on the local labour market as a whole (Armington and Acs 2002). In this regard, a high level of regional human capital indicates that a significant number of nascent entrepreneurs might have a higher degree, but also that the individuals planning to start a company will have relatively easy access to highly educated employees and expertise. The importance of skills with regard to the
activities of a newly established firm has been confirmed by a number of studies on companies in different sectors of the economy (Borggren, Eriksson, and Lindgren 2016; Broader and Eriksson 2013; Heebels and Boschma 2011; Klepper 2002).

Besides direct link between human capital and regional start-up activities, there is also a motivational aspect as human capital might influence what type of individuals take decision to start a company. One of the most important distinctions regarding entrepreneurial motivation is the difference between necessity-driven and opportunity-driven entrepreneurs (Acs 2006; Reynolds et al. 2001). At one extreme, an opportunity-driven entrepreneur may start a business in response to a perceived business opportunity, assuming that this is the best available allocation of skills and resources. At the other extreme, a necessity-driven entrepreneur is forced to start a business because of a lack of other options (e.g. lack of, or unsatisfactory, employment opportunities).

In the case of Sweden, where the unemployment level is relatively low and population is protected by a well-developed welfare system, the share of necessity-driven entrepreneurship is one of the lowest among developed countries, and the vast majority of entrepreneurial decisions are driven by identified opportunity (Kelley, Singer, and Herrington 2016; Singer, Amoros, and Arreola 2015). Still, such findings do not exclude the possibility that necessity-driven entrepreneurship might be prevalent in some regional contexts as previous studies have shown that the availability of job opportunities in incumbent firms are scarcer in the most remote areas in Sweden due to the spatially selective restructuring of manufacturing sectors (Eriksson and Hane-Weijman 2017).

Therefore, regional endowments might play different roles for start-ups created by individuals driven by more opportunity- or necessity-driven motivations. In the case of human capital, both the most and least skilled individuals form a disproportionately high number of entrepreneurs (Parker 2018; Poschke 2013). Although a main distinctive factor between opportunity- and necessity-driven entrepreneurs is motivation, one can expect a higher presence of highly educated individuals among opportunity-driven entrepreneurs (Caliendo and Kritikos 2009; Furdas and Kohn 2011). This is because human capital might help to establish and run a business, but it also increases the availability of other attractive options for a nascent entrepreneur (Le 1999). In addition, recent empirical evidence for Sweden shows that people with a higher level of human capital are more likely to start a company when economic conditions are favourable compared to those with lower level of education (Svaleryd 2015). Therefore, to account for this specific role of human capital during favourable economic conditions, we expect:

\[(H1) \text{ A high level of human capital will trigger higher rates of start-ups in regions with low unemployment rates} \]

**Social capital and peripheries**

More relation-oriented perspectives on entrepreneurship highlight that similar to innovation and creativity, entrepreneurship is a social process (Florida, Adler, and Mellander 2017). Rutten (2017) for example emphasizes that while knowledge in essence is personal, it is also interdependent with knowledge of other individuals. While human capital concerns personal skills and capabilities, social capital is created through interactions between people (Coleman 1988). Therefore, another important regional factor might be social capital.

A high level of social capital allows trust and cooperation among individuals, and the compliance with laws and social rules is beneficial for the local community. According to Scott and Storper (1995), the regional industrial culture (in terms of mutual trust) is therefore crucial for local economic development. Helliwell and Putnam (1995), as well as Putnam (2007), argue that higher social capital is a main source of the differences in economic growth. Nevertheless, there is also some evidence of the ambiguous role of social capital. As emphasized by Malecki (2012), a high level of social capital can create too much bonding, which carries the risk of conformity and restricts entrepreneurial initiative and individual freedom. Two examples of the possible negative
outcomes of social capital discussed in the literature are the closure of networks and collective blindness (Malecki 2012; Tura and Harmaakorpi 2005).

To tackle this ambiguous role of social capital, a more in-depth analysis of its different aspects is needed. Already Granovetter (1973) distinguished between different types of relations: ‘strong’ ties such as family and friends and ‘weak’ concerning loose type of relationships such as acquaintances. A more recent distinction is between bonding and bridging aspects of social capital (Putnam 2001). While bonding social capital represents dense networks of homogeneous groups (such as families), bridging social capital refers to more inclusive heterogeneous networks spanning over different groups within society. From the perspective of the individual entrepreneur, both types of social connections might be relevant when starting and running a business (Parker 2018).

However, although social ties per definition are made between individual actors, the regional aggregate of social capital also influence regional development (Cortinovis et al. 2017). In the case of Sweden, Westlund, Larsson, and Olsson (2014) provide some evidence that different aspects of social capital related to civil society at regional level can contribute positively to the propensity of establishing a new enterprise. In addition, as emphasized by Parker (2018) an important feature of social capital is that it might serve as a substitute for other resources that are otherwise unavailable for local entrepreneurs. This substitute feature of social capital might be of particular importance for regions facing unfavourable economic conditions. For this reason, to account for the substitute feature of social capital we can expect:

(H2a) A high level of social capital will trigger higher rates of start-ups in regions with high unemployment rates

The substitutive role of social capital might be important not only in regions with unfavourable economic conditions in a certain period, but also in regions with an unfavourable location. In this regard, the role of cities attracts particular attention in entrepreneurship research. Consequently, the mainly urban perspective in the literature situates rural locations at the opposite side of the spectrum without distinguishing between rural and peripheral areas. This paper extends this literature. Although rural areas are often also peripheral, being rural and being peripheral imply different types of challenges to entrepreneurial activities. In case of rural regions, there is likely to be a scarcity of local resources while the prime challenge for peripheral regions might also be a lack of accessibility to adjacent resource-rich urban environments. As shown by Hedlund (2016), rural areas in Sweden in close vicinity to urban centres are in fact very different types of locations than more peripheral locations.

A possible way to compensate for a shortage of assets on the regional level might be reaching places, such as large metropolitan regions, where they are abundant. From this perspective, relative proximity to a large city can be an advantage and compensate for problems stemming from shortages of human factors, low population density and an overly specialized regional economy. This mechanism might imply that, for peripheral regions, all factors supporting entrepreneurship development that are available within the region might be relatively more important than for more centrally located regions. There is, however, a caveat regarding this mechanism. Peripheral regions might not have enough local assets to support local development at all (McCann and Ortega-Argilés 2016), and at the same time they may be too distant to support entrepreneurial activities through linkages with the core. In such case, the effects of local assets can be lower than in more centrally located regions, as the regions lack critical mass for entrepreneurship development.

Still, the substitute feature of social capital might be of importance not only for regions with unfavourable regional conditions in terms of high unemployment rates, but also for regional economies where other resources are scarce. For this reason, we can expect that:

(H2b) A high level of social capital will trigger higher rates of start-ups in peripheral regions
Entrepreneurial culture

Another factor affecting regional start-up rates is entrepreneurial culture (Andersson and Koster, 2010; Armington and Acs 2002), which is also referred to as business social capital (Westlund, Larsson, and Olsson 2014). Entrepreneurial culture concerns the perception of the local population and institutions regarding entrepreneurship. There is evidence that low entrepreneurial culture might be the result of the presence of large-scale industries and highly specialized economy in the past. Even if the industrial profile of the local economy has changed, the attitudes tend to be transferred across generations (Glaeser, Kerr, and Kerr 2015; Stuetzer et al. 2016). Also as other informal institutions, which are deeply rooted into the population, entrepreneurial culture tend to evolve very slowly (Glaeser, Kerr, and Kerr 2015).

The presence of entrepreneurial culture indicates positive attitudes of regional population towards individuals who favour own business activity over gainful employment (Fritsch and Wyrwich 2014). An abundance of entrepreneurial culture encourages people to become engaged in start-ups, as they as well as other members of society acknowledge such activities as significant and positive for the community. In this regard, entrepreneurial culture might be considered as an attitude of regional population rather than regional resource or capability. Therefore, the role of entrepreneurial culture is likely to be an universal character. That is because a higher share of the local population might be interested in start-ups independently of other regional settings. Consequently, we can expect that:

(H3) The role of entrepreneurial culture remains the same across regions independent of other regional characteristics

Urbanization and localization

Other crucial aspects of the regional context of start-up propensity are the potential agglomeration effects. They can be differentiated into urbanization and localization economies (Beaudry and Schiffauerova 2009; Bosma and Sternberg 2014). The most recent literature emphasizes the role of specialization, related variety and unrelated variety in the development of competitive regional economy as well as the creation of new business entrants.

Maintaining-related variety within the industrial structure allows for recombining existing skills and resources into new products and services, and facilitates primarily incremental innovation (Boschma 2015), while unrelated variety increases the probability of technological breakthroughs (Castaldi, Frenken, and Los 2015). At the other extreme, the domination of a region’s economy by specific sectors may cause the problem of lock-in and limit openness and flexibility (Boschma 2015). It might also take time for the specific industry to dominate the regional economy, and therefore highly specialized regions might be dominated by industries in the late stage of the industrial life cycle when the number of new entries is relatively low (Fritsch and Mueller 2007; Klepper 1997).

Although we might expect that highly specialized regions suffer from lock-in effects and therefore lower start-up activities, these effects might not always be equally detrimental and depend on both the size of the population and how favourable the regional economic conditions are.

The size of the population in the region provides key resources for business development, and delineates the size of the market. Recent labour market research shows that thick labour markets provide better (faster and more precise) employer–employee matching (Duranton and Jayet 2011). As shown by Bleakley and Lin (2012), in areas with a higher population density, employees tend to be less likely to change occupation or industry. The lower mobility between industries allows for less recombination of inter-industry skills and resources, which is the attribute of diversified economies (Glaeser et al. 1992). As urban regions are also more likely to provide better access to assets that complement human and social capital, we expect that in the case of more urbanized areas the difference in start-up rates between diverse and specialized economies will be smaller.
Another argument considering specialization points towards same effect, but builds on the role of relative (share of the sector) and absolute (size of the sector) specialization. As emphasized by Kemeny and Storper (2015), every industry sector needs specific inputs, such as skilled labour, knowledge or supply chains. Therefore, a certain degree of absolute specialization is necessary to provide the sector with all the necessary inputs. Moreover, increasing absolute specialization provides Marshallian externalities of localization for regional economy through at least three mechanisms: sharing of input of suppliers, matching of specialized labour and supply, technological learning and spillovers (Florida, Adler, and Mellander 2017; Kemeny and Storper 2015).

In this regard, large regions can be more diversified (have lower relative specialization) as they are able to provide larger number of sectors with necessary inputs, but they also might benefit from high degree of absolute specialization by utilizing Marshallian externalities. Therefore, while high level of relative specialization might hinder start-up levels in all the regions this effect might be partially compensated by Marshallian externalities in the case of large regions. Hence, in our next hypothesis, we expect that:

(H4a) The larger (the more densely populated) a region is the less harmful relative specialization will be for the regional start-up rate

The effect of relative specialization on regional start-up rates might also depend on regional unemployment levels. The reason for this is that specialized regions have very limited capacity to absorb a negative economic shock. In such case, a specialized industrial structure facilitates neither recombination nor restructuring (Boschma 2015). Alternatively, in case of economic upturn, opportunity- and demand-driven driven start-ups might emerge in sectors such as retail or restaurant, which serves the needs of the principal sector and its employees. Hence, our final hypothesis is formulated as follows:

(H4b) A high level of regional relative specialization has less detrimental effect on start-up levels in regions with low unemployment rates

Data

The data used in this paper comes from three different sources. Regional macro-data for the entire Swedish economy comes from Statistics Sweden, the rAps-RIS database that is maintained by the Swedish Agency for Economic and Regional Growth (Tillväxtverket), and the Business Climate Database managed by the Federation of Swedish Enterprise (Svenskt Näringsliv). All data was collected for the period 2002–2012 at the municipal level.

Dependent variable

To calculate the value of the StartUpRate variable used in the analysis, the number of newly formed microenterprises (0–9 employees) per 10,000 inhabitants of working age (16–64) was determined. This category covers the legal definition of microenterprise according to the European Commission (2003), which is also widely used in the literature (Donner and Escobari 2010). In the case of microenterprises, the personal involvement of the entrepreneur is the central element of the enterprise (Mead and Liedholm 1998). We can therefore expect a direct link between the human factor and the start-up foundation. The ratio of start-ups per working age population is one of the most common approaches for measuring regional entrepreneurial activities and is considered as closely associated with being an entrepreneur as occupational choice (Parker 2018).

The start-up rates per 10,000 inhabitants are presented in Figure 1. The map displays some noteworthy regional differences. First, there are on average higher start-up rates in the north-western part of Sweden while there is a somewhat lower start-up rate in the middle part of the country. Hence, the remote Swedish municipalities close to the Norwegian border are characterized by a high level of
entrepreneurship activities compared to the rest of the country. This pattern is likely to originate from necessity-driven entrepreneurship due to the relative job-shortage in these regions (Eriksson and Hane-Weijman 2017). Still, although these areas are relatively large on the map, few people reside there compared to many of the municipalities in the South. The map thus magnifies the relative importance of these areas as the start-up rates consist of relatively few persons.

Independent variables

To assess the role of the human factor, three variables have been created: human capital, social capital and entrepreneurial culture. In line with many previous studies (Eriksson, Hansen, and Lindgren 2014; Eriksson and Forslund 2013; Westlund, Larsson, and Olsson 2014), human capital is measured as the share of the population with an education level equivalent to a bachelor’s degree or higher (three or more years of study) in the given municipality.

The social capital variable aims to evaluate the general level of trust in society and towards local public officials. Social capital in essence concerns individuals and their social relations, which is why it is difficult to empirically operationalize at regional level (Malecki 2012; Rutten and Gelissen 2010). As shown by Westlund and Adam (2010) in the context of measuring economic performance, the two most commonly applied measures of social capital are declared trust in other people and
membership in associations. The former tends to be more suited for international comparisons, and
the latter for comparing levels of social capital on regional level (Westlund and Adam 2010). The
latter is also used to capture differences across regions in ‘bridging aspect’ of social capital
(Crescenzi, Gagliardi, and Percoco 2013). That is, how heterogenous and inclusive networks are
within society. In line with these findings, we use the number of associations (per 1000 inhabitants)
registered on the municipality level as a proxy for social capital.2

The indicator of local entrepreneurial culture (Armington and Acs 2002) is based on the
percentage share of entrepreneurs who assess the local (municipal) attitudes towards entrepre-
neurship as positive. As demonstrated by Westlund, Larsson, and Olsson (2014), a company’s
perception of attitudes towards entrepreneurship strongly correlates with the overall judgment
of the local business climate. This is based on annual representative surveys by the Federation of
Swedish Enterprise sent to 60,000 member and non-member companies, and is defined as the
percentage of all responding firms in the region that perceive the municipal attitudes towards
entrepreneurship as supportive (Foretagsklimat.se).

To assess the role of agglomeration, we created two indicators. First, the Herfindahl specializa-
tion index was calculated to assess the role of relative specialization. It is calculated as the sum
of the squares of the job shares of the firms from each industry within the total job number.3 The
higher the index value, the more specialized the economy is.4 The index tends towards 0 in the
case of a large number of industries with equal employment shares, and is equal to 1 when all the
jobs are concentrated within one industry (Izraeli and Murphy 2003). As discussed in the next
section, the Herfindahl index was calculated on functional labour markets level to account for
existing industrial linkages between municipalities.5

To control the potential impact of urbanization, a second indicator reflecting regional density
was created. This is defined as the number of employees per square kilometre. The density index
was calculated on the municipality level to account for differences between more and less
urbanized municipalities within the same functional labour market. Apart from capturing the
potential effects of size, this variable also tends to capture many of the unobserved regional
characteristics that cannot be modelled (Boschma, Eriksson, and Lindgren 2014).

Finally, to account for situation on the regional labour market an unemployment indicator was
created based on the share of population actively seeking employment. Low levels of unemploy-
ment might encourage as well as discourage some types of entrepreneurs (Armington and Acs
2002; Caliendo and Kritikos 2009). We make no theoretical assumptions which mechanism might
be of greater magnitude, but as discussed in the theoretical section unemployment levels might
influence the magnitude of the impact of human and social capital as well as relative specialization
on start-up formation at the regional level.

**Control variables**

Similarly to other studies (Westlund, Larsson, and Olsson 2014; Westlund and Bolton 2003), we control for
a set of factors that may co-determine start-up rates. For countries that attract immigrants, like Sweden,
the regional share of migrants can be a potentially important factor that affects the start-up rate. As
emphasized by Kloosterman (2010) and Kloosterman and Rath (2001), the opportunity structures of
nascent entrepreneurs might be divergent depending on ethnical background. For example, qualifica-
tions obtained and valued in one country do not necessarily improve the labour market performance in
the new country of residence. Alternatively, as emphasized by Kloosterman and Rath (2001) in many
advanced economies, there is a growing number of highly skilled immigrant entrepreneurs coming from
emerging economies, who do not fit into the traditional picture of low-skill immigrant. Also, in case of
strong ethnic communities, social capital might overlap strongly with ethnic capital (Kloosterman 2010).
To control for that, an indicator reflecting the share of the population born outside the Nordic countries is
created.
A final set of variables is set to control for various institutional differences: the share of the public employed at the municipal level, and the average salary in the public sector at the municipal level. This is because the accessibility of public employment and high wages can act as discouraging factors for entrepreneurship (Eriksson and Hansen 2013). For a similar reason, the share of external services purchased in municipalities compared to the total costs of their operations was introduced. This is because the political decision to outsource public services to private service providers might temporarily increase the number of start-ups.

In our more detailed model estimations, we control also for the possible impact of peripheral location. To account for this factor, we apply regional division based on methodology developed by the Agency for Growth Policy Analysis (Myndigheten för tillväxtpolitiska utvärderingar och analyser). We distinguish between metropolitan regions, regions near a city and remote regions (see Figure 2).

In Table 1, all the variables used in the analysis are briefly described and the main summary statistics are provided. The number of observations is a result of introducing data on 290 municipalities for the period 2002–2012. To mitigate the potential problem of reversed causality, lagged values (t-1) were used for all right-hand-side variables. Table A1 in the Appendix presents the correlations between the variables model, from which we can conclude that no serious issues of multicollinearity are detected.
Analytical approach

In this paper, we propose an application of a three-level model to account for local and regional, as well as time effects. An analysis of geographical locations on two spatial scales allows us to take into account the spatial context, since the municipality perspective allows an analysis of municipality-specific factors, such as the abundance of human and social capital, while the functional region level (FA region) permits us to assess the impact of workforce connections between municipalities. In the case of FA regions, this is not proxied by distance only but is the result of existing infrastructure, labour flows and industrial links between municipalities (Tillvaxtanalyss 2013), and does not follow regional administrative divisions. For example, municipalities that belong to the same county are often categorized as parts of different functional regions. As emphasized by Shearmur (2011), functional regions are clearly preferable to arbitrary administrative units and in order to fully account for industrial links between municipalities, we measure the degree of relative specialization on the FA regional level.

The lowest level in the model is the year, followed by the municipality, meaning that specific periods are treated as repeated measures for each municipality. According to Goldstein and Noden (2003), using repeated measures for municipalities instead of limiting the data to a cross-section for a single year provides more robust results. The second and third levels of the model are defined at the municipality and functional region levels, respectively, which means that municipalities are considered to be nested within the functional region where they are located (Rabe-Hesketh and Skrondal 2005). Random intercept models assume two parts of the error term, one at municipality level and another at functional regional level. The latter part of the error term captures unobserved factors that may affect the start-up rate, which are common to all municipalities in the same region but are different from municipalities in other regions. This means that if some resources are available to the entrepreneurs outside the municipality, but within the same region (e.g. due to good transport and communication infrastructure), then the availability of these resources is considered and should not bias the results (Rabe-Hesketh and Skrondal 2005).

The multilevel approach has a significant advantage. On the one hand, it considers regional characteristics that are not directly controlled for by the set of variables used in the model. On the

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>StartUpRate</td>
<td>Number of municipal start-ups per 10,000 inhabitants</td>
<td>135.53</td>
<td>43.10</td>
<td>44.87</td>
<td>366.42</td>
</tr>
<tr>
<td>Independent variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– human factor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial culture</td>
<td>Percentage share of entrepreneurs positively assessing local (municipal)</td>
<td>43.15</td>
<td>13.78</td>
<td>5.26</td>
<td>87.00</td>
</tr>
<tr>
<td>Social capital</td>
<td>Number of associations registered in Bolagsverket per 1000</td>
<td>9.00</td>
<td>4.84</td>
<td>0.38</td>
<td>56.05</td>
</tr>
<tr>
<td>Human capital</td>
<td>Share of population with at least a Bachelor’s degree</td>
<td>0.12</td>
<td>0.06</td>
<td>0.05</td>
<td>0.46</td>
</tr>
<tr>
<td>Independent variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– agglomeration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial specialization</td>
<td>Herfindahl specialization index</td>
<td>0.15</td>
<td>0.02</td>
<td>0.10</td>
<td>0.27</td>
</tr>
<tr>
<td>Density</td>
<td>Employee density, number of working population per km² on municipality level</td>
<td>66.05</td>
<td>308.01</td>
<td>0.11</td>
<td>3689.79</td>
</tr>
<tr>
<td>Controllers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign</td>
<td>Share of foreign-born population for each municipality</td>
<td>0.10</td>
<td>0.05</td>
<td>0.02</td>
<td>0.40</td>
</tr>
<tr>
<td>Unemployed</td>
<td>Unemployment, share of population actively seeking employment</td>
<td>0.02</td>
<td>0.01</td>
<td>0.00</td>
<td>0.11</td>
</tr>
<tr>
<td>Public employed</td>
<td>Share of public employed on municipal level</td>
<td>0.34</td>
<td>0.07</td>
<td>0.15</td>
<td>0.56</td>
</tr>
<tr>
<td>Public salary</td>
<td>Average salary in public sector on municipal level (in 1000 SEK)</td>
<td>231.97</td>
<td>32.78</td>
<td>153.00</td>
<td>409.81</td>
</tr>
<tr>
<td>Municipality contracts</td>
<td>Share of external services purchased in municipalities compared to total cost</td>
<td>16.88</td>
<td>7.57</td>
<td>2.00</td>
<td>53.00</td>
</tr>
</tbody>
</table>

Table 1. Description of variables (N = 2889)
other, it allows variables to be used with low variation over time, which is not appropriate in a fixed-effect (within) setting (Rabe-Hesketh and Skrondal 2005).

**Results**

All the regression results are presented in Table 2. The results of Model 1, presented as a point of reference, are in line with our expectations. The main effects of human capital, social capital and entrepreneurial culture on start-up formation are positive while the effect of relative specialization is negative. All the main effects are statistically significant. As our variables are used in logarithmic format, the model results can be interpreted as elasticities and the magnitudes of the effects can be compared (Gelman and Hill 2006). The effects of human capital and relative specialization are largest across different model specifications, and suggest that a per cent change in the level of human capital or relative specialization is associated with approximately a half per cent lower/higher start-up rates. The magnitude of the effects of social capital and entrepreneurial culture is one-fifth of human capital and relative specialization.

Continuing with Model 2, the interaction effects between these four factors and unemployment levels were introduced. Changing the model specification did not substantially alter the main effects presented in Model 1. The interaction effects are supposed to verify the moderating role of favourable economic conditions (unemployment levels) hypothesized in the theoretical section. The interaction effect is not significant in the case of human capital. We therefore need to reject the first hypothesis (H1) stating that a high level of human capital will trigger higher rates of start-ups in regions with low unemployment rates. In our hypothesis H2a, we expected that a high level of social capital would trigger higher rates of start-ups in regions with high unemployment rates. As the interaction effect is positive and statistically significant, we can confirm the hypothesis H2a.

Similarly to human capital, the interaction effect between entrepreneurial culture and unemployment level is not statistically significant. In our third hypothesis, we theorized that the role of entrepreneurial culture would remain the same across regions with diverse unemployment levels. Therefore, we can confirm the third hypothesis (H3). Finally, in our hypothesis H4b, we expected that a high level of regional relative specialization has less detrimental effect on start-up levels in regions with low unemployment rates. The negative and statistically significant interaction between relative specialization and unemployment level indicates that the mitigating role of relative specialization is indeed smaller when unemployment levels are low. This confirms our hypothesis H4b.

To take the possible moderating effects of the core-periphery dimension into account, Models 3a, 3b and 3c were estimated. The models have the same specification as Model 2, but were estimated separately for metropolitan regions (3a), regions in or near a middle-sized city (3b) and remote regions (3c). After splitting the sample, the main effects of human capital and relative specialization across core-periphery dimension remain similar to the effects revealed in both Model 1 and 2. The positive effect of social capital remains statistically significant only in peripheral regions (Model 3c). This confirms our hypothesis H2b that a high level of social capital will trigger higher rates of start-ups in peripheral regions. The effect of entrepreneurial culture is no longer statistically significant in any of the split-sample models. Similarly, none but one interaction with unemployment is significant. The only exception is the interaction effect of relative specialization and unemployment in metropolitan setting.

In our final step of estimation process, Models 4a, 4b and 4c are introduced which aim to test the possible moderation effects of matching efficiency of regional labour markets. They are estimated for the same type regional settings as Models 3a, 3b and 3c, but include also interactions between population density and human capital, social capital, and entrepreneurial culture as well as relative specialization. The vast majority of these effects is not statistically significant. The exception is the positive interaction between social capital and population density in peripheral regions and the negative interaction between human capital and population density in regions.
Table 2. Multilevel (ML) models on start-up rates in Swedish municipalities 2002–2012. Coefficients (b) and standard errors (SE) are reported.

<table>
<thead>
<tr>
<th></th>
<th>(1) Basic</th>
<th>(2) Interaction</th>
<th>(3a) Interaction Metro</th>
<th>(3b) Interaction Close to a city</th>
<th>(3c) InteractionPeriphones</th>
<th>(4a) Full Metro</th>
<th>(4b) Full Close to a city</th>
<th>(4c) FullPeriphones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human capital</td>
<td>0.513***</td>
<td>0.586***</td>
<td>0.537***</td>
<td>0.607***</td>
<td>0.710**</td>
<td>0.613***</td>
<td>0.805***</td>
<td>0.643**</td>
</tr>
<tr>
<td></td>
<td>(12.25)</td>
<td>(7.31)</td>
<td>(4.21)</td>
<td>(4.07)</td>
<td>(3.11)</td>
<td>(3.69)</td>
<td>(4.76)</td>
<td>(2.83)</td>
</tr>
<tr>
<td>Social capital</td>
<td>0.0994***</td>
<td>0.232***</td>
<td>0.114</td>
<td>0.169</td>
<td>0.381***</td>
<td>0.0634</td>
<td>0.157</td>
<td>0.348**</td>
</tr>
<tr>
<td></td>
<td>(4.75)</td>
<td>(3.93)</td>
<td>(1.10)</td>
<td>(1.67)</td>
<td>(3.37)</td>
<td>(0.50)</td>
<td>(1.39)</td>
<td>(3.10)</td>
</tr>
<tr>
<td>Entrepreneurial culture</td>
<td>0.0806***</td>
<td>0.125*</td>
<td>0.0790</td>
<td>0.0796</td>
<td>0.212</td>
<td>0.138</td>
<td>0.127</td>
<td>0.214</td>
</tr>
<tr>
<td></td>
<td>(6.02)</td>
<td>(2.03)</td>
<td>(0.72)</td>
<td>(0.66)</td>
<td>(1.72)</td>
<td>(1.12)</td>
<td>(1.00)</td>
<td>(1.73)</td>
</tr>
<tr>
<td>Specialization</td>
<td>−0.407***</td>
<td>−0.966***</td>
<td>−2.64***</td>
<td>−2.062**</td>
<td>−0.837*</td>
<td>−2.669***</td>
<td>−1.469***</td>
<td>−0.882*</td>
</tr>
<tr>
<td></td>
<td>(−7.43)</td>
<td>(−4.87)</td>
<td>(−5.62)</td>
<td>(−2.81)</td>
<td>(−2.29)</td>
<td>(−5.54)</td>
<td>(−3.45)</td>
<td>(−2.39)</td>
</tr>
<tr>
<td>Density</td>
<td>−0.199***</td>
<td>−0.177***</td>
<td>−0.321***</td>
<td>−0.173***</td>
<td>−0.135</td>
<td>−0.190</td>
<td>0.0246</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(−17.78)</td>
<td>(−17.35)</td>
<td>(−7.94)</td>
<td>(−15.99)</td>
<td>(−7.55)</td>
<td>(−1.02)</td>
<td>(−0.78)</td>
<td>(0.13)</td>
</tr>
<tr>
<td>Foreign population</td>
<td>0.0497</td>
<td>0.0458</td>
<td>0.0657</td>
<td>0.100*</td>
<td>0.0537</td>
<td>0.0540</td>
<td>0.0579</td>
<td>0.0583</td>
</tr>
<tr>
<td></td>
<td>(1.84)</td>
<td>(1.69)</td>
<td>(1.10)</td>
<td>(2.22)</td>
<td>(1.28)</td>
<td>(0.88)</td>
<td>(1.22)</td>
<td>(1.32)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>0.00109</td>
<td>−0.311*</td>
<td>−0.758***</td>
<td>−0.265</td>
<td>−0.247</td>
<td>−0.728***</td>
<td>−0.284</td>
<td>−0.196</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(−2.41)</td>
<td>(−3.45)</td>
<td>(−1.00)</td>
<td>(−0.85)</td>
<td>(−3.30)</td>
<td>(−1.07)</td>
<td>(−0.67)</td>
</tr>
<tr>
<td>Public employed</td>
<td>−0.156**</td>
<td>−0.151**</td>
<td>0.0298</td>
<td>−0.211**</td>
<td>−0.188</td>
<td>0.0331</td>
<td>−0.154*</td>
<td>−0.231*</td>
</tr>
<tr>
<td></td>
<td>(−3.15)</td>
<td>(−3.05)</td>
<td>(0.41)</td>
<td>(−2.80)</td>
<td>(−1.79)</td>
<td>(0.46)</td>
<td>(−2.00)</td>
<td>(−2.16)</td>
</tr>
<tr>
<td>Public salary</td>
<td>0.684***</td>
<td>0.701***</td>
<td>0.914***</td>
<td>0.592***</td>
<td>0.786***</td>
<td>0.936***</td>
<td>0.675***</td>
<td>0.842***</td>
</tr>
<tr>
<td></td>
<td>(10.21)</td>
<td>(10.38)</td>
<td>(7.94)</td>
<td>(5.83)</td>
<td>(5.43)</td>
<td>(8.00)</td>
<td>(6.45)</td>
<td>(5.77)</td>
</tr>
<tr>
<td>Municipal contracts</td>
<td>0.0276*</td>
<td>0.0270*</td>
<td>−0.00804</td>
<td>0.0424*</td>
<td>0.0365</td>
<td>−0.0118</td>
<td>0.00408*</td>
<td>0.0289</td>
</tr>
<tr>
<td></td>
<td>(2.04)</td>
<td>(2.00)</td>
<td>(−0.30)</td>
<td>(2.09)</td>
<td>(1.48)</td>
<td>(−0.44)</td>
<td>(2.01)</td>
<td>(1.18)</td>
</tr>
<tr>
<td>Human capital</td>
<td>0.0174</td>
<td></td>
<td>0.00057</td>
<td>0.00824</td>
<td>0.0088</td>
<td>0.00141</td>
<td>0.0014</td>
<td>0.0011</td>
</tr>
<tr>
<td>*Unemployed</td>
<td>(1.05)</td>
<td></td>
<td>(0.24)</td>
<td>(0.24)</td>
<td>(1.54)</td>
<td>(0.06)</td>
<td>(0.30)</td>
<td>(1.57)</td>
</tr>
<tr>
<td>Social capital</td>
<td>0.0307*</td>
<td></td>
<td>0.00402</td>
<td>0.0442</td>
<td>0.0520</td>
<td>0.00545</td>
<td>0.0453</td>
<td>0.0597*</td>
</tr>
<tr>
<td>*Unemployed</td>
<td>(2.37)</td>
<td></td>
<td>(0.19)</td>
<td>(1.87)</td>
<td>(1.82)</td>
<td>(0.26)</td>
<td>(1.93)</td>
<td>(2.08)</td>
</tr>
<tr>
<td>Entrepreneurial culture</td>
<td>0.0126</td>
<td></td>
<td>−0.000657</td>
<td>0.00485</td>
<td>0.0298</td>
<td>−0.00183</td>
<td>0.00477</td>
<td>0.0234</td>
</tr>
<tr>
<td>*Unemployed</td>
<td>(0.79)</td>
<td></td>
<td>(−0.03)</td>
<td>(0.15)</td>
<td>(0.87)</td>
<td>(−0.08)</td>
<td>(0.15)</td>
<td>(0.67)</td>
</tr>
<tr>
<td>Specialization</td>
<td>−0.125**</td>
<td>−0.424***</td>
<td>−0.0816</td>
<td>−0.121</td>
<td>−0.404***</td>
<td>−0.0934</td>
<td>−0.101</td>
<td></td>
</tr>
<tr>
<td>*Unemployed</td>
<td>(−2.86)</td>
<td>(−4.49)</td>
<td>(−1.03)</td>
<td>(−1.35)</td>
<td>(−4.19)</td>
<td>(−1.16)</td>
<td>(−1.0)</td>
<td>(−1.10)</td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th></th>
<th>(1) Basic</th>
<th>(2) Interaction</th>
<th>(3a) Interaction</th>
<th>(3b) Interaction</th>
<th>(3c) Interaction</th>
<th>(4a) Full Metro</th>
<th>(4b) Full Close to a city</th>
<th>(4c) Full Peripheries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialization</td>
<td>-3.415***</td>
<td>-4.969***</td>
<td>-9.909***</td>
<td>-3.262</td>
<td>-6.195***</td>
<td>0.0283</td>
<td>0.137</td>
<td>0.0907</td>
</tr>
<tr>
<td>Density</td>
<td>(-3.54)</td>
<td>(-4.35)</td>
<td>(-4.88)</td>
<td>(-1.72)</td>
<td>(-2.62)</td>
<td>(-10.25***</td>
<td>(-4.843*)</td>
<td>(-7.057**)</td>
</tr>
<tr>
<td>Between-region S.D.</td>
<td>-2.139***</td>
<td>-2.099***</td>
<td>-25.92</td>
<td>-1.932***</td>
<td>-1.678***</td>
<td>-24.47</td>
<td>-1.865***</td>
<td>-1.611***</td>
</tr>
<tr>
<td></td>
<td>(-10.11)</td>
<td>(-10.01)</td>
<td>()</td>
<td>(-8.28)</td>
<td>(-8.08)</td>
<td>(-1.55)</td>
<td>(-8.18)</td>
<td>(-8.73)</td>
</tr>
<tr>
<td>Between-municipality S.D.</td>
<td>-1.621***</td>
<td>-1.608***</td>
<td>-1.506***</td>
<td>-1.788***</td>
<td>-2.098***</td>
<td>-1.495***</td>
<td>-1.789***</td>
<td>-2.219***</td>
</tr>
<tr>
<td></td>
<td>(-30.10)</td>
<td>(-29.72)</td>
<td>(-17.22)</td>
<td>(-23.16)</td>
<td>(-10.05)</td>
<td>(-15.62)</td>
<td>(-23.26)</td>
<td>(-9.43)</td>
</tr>
<tr>
<td>Between-year S.D.</td>
<td>-1.993***</td>
<td>-1.999***</td>
<td>-2.289***</td>
<td>-1.932***</td>
<td>-1.924***</td>
<td>-2.292***</td>
<td>-1.939***</td>
<td>-1.928***</td>
</tr>
<tr>
<td></td>
<td>(-142.73)</td>
<td>(-143.01)</td>
<td>(-87.36)</td>
<td>(-94.52)</td>
<td>(-67.95)</td>
<td>(-86.08)</td>
<td>(-94.68)</td>
<td>(-67.45)</td>
</tr>
<tr>
<td>Observations</td>
<td>2889</td>
<td>2889</td>
<td>829</td>
<td>1350</td>
<td>710</td>
<td>829</td>
<td>1350</td>
<td>710</td>
</tr>
</tbody>
</table>

Note: * p<0.10, ** p<0.05, *** p<0.01.
located in the vicinity of middle-sized cities. These results give nearly no support to our theoretical expectations regarding moderating role of matching efficiency. In particular, there is no evidence that the more densely populated a region is, the less harmful is relative specialization for start-ups levels. Therefore, we reject our hypothesis H4a.

The remaining results of Models 4a, 4b and 4c are very similar to the results of Models 3a, 3b and 3c. The only difference is that in peripheral regions, there is a statistically significant positive interaction of social capital and unemployment (similarly to the results presented in Model 2).

It should also be noted that the control variables across different models mostly confirm our expectations and are relatively unaffected across the different model specifications. In line with our expectations, the size of the public sector proxied as the share of public employees is negatively related to start-ups, while the outsourcing of public services increases start-ups. There is also a positive correlation of salaries in the public sector, which might be explained by higher salaries in more affluent regions.

Summary and discussion

The aim of this study was to investigate the role of human factors in the regional start-up creation process in different spatial contexts. Our findings suggest that human capital, social capital and entrepreneurial culture are important for the variation of start-up rates across municipalities in Sweden, while relative specialization impedes new firm formation. These results are fully in line with theoretical predictions and earlier empirical findings on human capital (cf. Kim, Aldrich, and Keister (2006), entrepreneurial culture (Fritsch and Wyrwich 2014) and specialization (Boschma 2015; Klepper 1997). We do however provide new knowledge on under which regional circumstances these factors matter.

Human capital turned out to be a significant and positive factor explaining the regional variation of start-up levels both when all regions are included, as well as within separate categories of regions characterized by different degree of peripherality (metropolitan, close to a city, peripheries). This suggests that start-up levels in all types of regional settings are positively related to human capital and there is no threshold in terms of distance to a regional centre or size of agglomeration below which local human capital is less relevant for entrepreneurial activities.

Against our theoretical expectations formulated in Hypothesis 1, there is no evidence that the role of human capital is stronger in the regions where unemployment levels are low. This finding emphasizes external effects of human capital and suggests that a high level of regional human capital might facilitate regional start-up activities mainly due to availability of educated workforce rather than due to activities of educated, opportunity-driven entrepreneurs (Armington and Acs 2002). Moreover, neither in metropolitan nor in peripheral regions does the degree of urbanization (population density) moderate the main effect of human capital. There is only a statistically significant negative interaction of human capital and population density in regions located close to a middle-sized city. Our interpretation of this finding is that it represents the effect of local administration centres where highly educated public sector employees are concentrated, who tend to have limited entrepreneurial ambitions.

The results of Model 2 revealed that social capital is positively associated with start-up activities. The results also confirmed Hypothesis 2a claiming that the role of social capital will trigger higher start-up rates in regions with high unemployment rates. The estimation of separate models for regions characterized by different degree of peripherality shows that social capital could explain variation in start-up levels only in peripheral regions. This is in line with Hypothesis 2b stating that a high level of social capital will trigger higher rates of start-ups in peripheral regions. Therefore, our results confirm that social capital indeed plays substitutitional role for regions facing unfavourable economic conditions or with relatively scarce resources. Our final finding concerning social capital is that it plays a more important role in more densely populated peripheral settings (positive and statistically significant interaction effect of social capital and density). This suggests
that social capital might facilitate economic activities particularly in the centres of peripheral regions. As emphasized by Carson et al. (2017), municipal centres and amenity-rich locations in relative peripheries might be growth outliers hidden by the aggregated picture of regional decline. In this regard, it might be of particular interest for development strategies targeting peripheral centres as possible focal points of regional growth.

As expected in the literature review, the results of Model 2 confirmed the positive role of entrepreneurial culture as well as our Hypothesis 3 stating that the role of entrepreneurial culture remains the same across regions independent of other regional characteristics. This indicates that entrepreneurial culture has a similar role in different regional contexts. Interestingly, in none of the models estimated for separate categories of regions (metropolitan, close to a city, peripheries) entrepreneurial culture remains statistically significant. This suggests that while entrepreneurial culture is important on national level it has limited role when regions with more similar spatial characteristics are compared. It might be interpreted as the effect of populations living in similar spatial settings having similar degree of entrepreneurial culture.

The final factor assessed was the role of relative specialization. The results of Model 2 showed expected negative effect of relative specialization on start-up levels. They also confirmed our Hypothesis 4b, which stated that the effects of specialization would be less detrimental in regions with low unemployment rates. However, in the models estimated for separate categories of regions, this effect was retained only for metropolitan regions. It might be interpreted as only metropolitan regions are large enough to alleviate some negative effects of relative specialization through demand-driven entrepreneurship. This is indeed a very interesting finding, as we in line with the results of Model 4a-c rejected that the larger the region, the less harmful relative specialization for start-up rates will be (Hypothesis 4a). In light of all these results, metropolitan regions indeed suffer less from high level of relative specialization, but mainly in time of economic upturn and also because of demand-driven entrepreneurship. The difference theorized based on matching efficiency of low- and high-density labour markets as well as Marshallian externalities do not seem to play a significant role.

Our results also allow us to formulate practical recommendations regarding start-up policies, taking into account the specificity of rural and peripheral regions. According to our results, human capital enhances start-up activities in a similar way in different regional contexts. Therefore, it seems to be universal aspect of strategies for economic development. Similarly, high relative specialization has a detrimental effect across different locations. Nevertheless, this effect might be underestimated, in particular in metropolitan regions, during the periods of economic upturn when it is partially compensated by demand-driven entrepreneurship. As a result, entrepreneurial activities in specialized regions might be more pro-cyclical. From this perspective, and particularly in a metropolitan context, public policies could use periods of economic downturn to support start-up activities in new business areas, which otherwise could face problems due to competition for resources (employees, office space, etc.) from demand-driven entrepreneurship.

According to our results, social capital is a key aspect of entrepreneurial policies in peripheral regions as it can moderate the scarcity of local resources. Furthermore, this effect seems to be stronger in denser peripheral settings, which suggest that utilizing social capital should be an important part of growth strategies aiming to support micro-urbanized centres within peripheral regions. The caveat related to this finding is that social capital is a quite enigmatic concept referring to neither individual nor aggregated characteristics, but to latent bonding between individuals. In addition, the regional data does not allow us also to distinguish if it is social capital that plays different role or whether the results are driven by different kinds of entrepreneurs in peripheral and urban regions. These remain open questions for further investigation.
Finally, our results suggest that the effects of entrepreneurial culture might be a concern of entrepreneurship policies on national level, but at least in Swedish context it does not explain differences in start-up levels between similar spatial settings.

More generally, our results indicate that acknowledging the rural–urban dimension is not enough for understanding spatial variation of start-ups. We rather find that making a distinction between peripheral and rural locations is crucial to better understand the specific role of the same factors in different regional contexts. In case of entrepreneurship studies, our paper is one of the very few accounting for all these regional aspects. On policy level, it also calls for more context-oriented regional policies, as for example EU regional policy still does not distinguish between sparsely populated and peripheral areas.

Finally, a discussion of some caveats and a suggestion for future research are warranted. First, the presented analysis concerns the number of start-ups but does not directly address the problem of their quality nor individual rationales for establishing a firm. To resolve these issues, individual micro-data and/or more qualitative approaches are needed. Secondly, as documented by Andersson and Koster (2010) and Fritsch (2013), the drivers and effects of entrepreneurial activities are characterized by multiple time lags. Most of the spatial characteristics introduced in our models have very low within-variation, but we are aware that our modelling approach does not fully account for this problem. Our final caveat concerns the power of statistical inference. The multi-level modelling approach allowed us to incorporate spatial characteristics in our estimations with very low within-variation, but permits correlation rather than causal inference. We can therefore only partly disregard this problem by referring to other studies, such as Fritsch and Wyrwich (2016) and Bublitz, Fritsch, and Wyrwich (2015), which make causal inference evident for some of the mechanisms similar to those theorized in this paper.

Notes

1. In this study, larger enterprises (over nine employees) were not taken into account, as the founding of these companies might be driven by a different set of factors (e.g. direct foreign investments of international corporations) and is more the result of larger business projects than a consequence of the entrepreneurship of the local population per se.
2. Specifically, we use a number of organizations registered with Bolagsverket (Swedish company registration office), which also provide a register of foundations and various types of associations.
3. This approach, focused on employment shares, is one of the number of possible methods of calculating the index. When employing the labour market perspective, the number of people employed per industry sector can be used; or, alternatively, taking the perspective of business development, a number of sites can be used per sector. As proven by Eriksson, Hansen, and Lindgren (2014) in the case of Swedish regions, different methods show comparable results.
4. An important aspect of measuring specialization is how the industry is defined. Splitting industry into two sub-industries might decrease Herfindahl index. In this paper, we measure specialization on the most aggregated levels trying to capture the most pronounced differences.
5. To ensure the testing stability of the model results, models using Herfindahl index calculated on the municipality level were also estimated. The results were very similar, albeit with lower magnitude.
6. Due to changes in administrative division (concerning the municipalities of Heby and Knivsta) during the period analysed, the total number of observations amounts to 2892.
7. It should be noted that we first estimated a step-by-step procedure. In the first step, independent variables measuring human capital and social capital were introduced together with population density. In the second step, the variables for the share of the foreign-born population, the share of unemployed, and the share of public sector employment and average salary level were included. In the third step, we introduced independent variables representing specialization. As introducing additional variables changed neither the direction nor the significance of any of the variables, we have only presented the final version of the model.

Acknowledgments

The article benefited greatly from the comments of three anonymous referees. We would like also to thank Hans Westlund, Therese Danley, Einar Holm, Emelie Hane–Weijman, Charlotta Hedberg and Linda Lundmark for their
helpful comments on earlier versions of the manuscript. All usual disclaimers apply. Funding for this research was provided by The Swedish Research Council, grant 2016-01803.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

Funding for this research was provided by The Swedish Research Council, grant 2016-01803

ORCID

Rikard Eriksson http://orcid.org/0000-0003-3570-7690
Marcin Rataj http://orcid.org/0000-0002-5163-7859

References


Foretagsklimat.se. http://www.foretagsklimat.se/om/metodenkat


**Table A1.** Correlation matrix.

<table>
<thead>
<tr>
<th></th>
<th>StartUpRate</th>
<th>Entrepreneurial culture</th>
<th>Social capital</th>
<th>Human capital</th>
<th>Specialization</th>
<th>Density</th>
<th>Foreign</th>
<th>Unemployed</th>
<th>Public Employed</th>
<th>Public Salary</th>
<th>Municipality contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>StartUpRate</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial culture</td>
<td>0.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social capital</td>
<td>0.34*</td>
<td>−0.26*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human capital</td>
<td>0.11*</td>
<td>0.26*</td>
<td>0.10*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specialization</td>
<td>−0.13*</td>
<td>0.17</td>
<td>−0.21*</td>
<td>−0.09*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>−0.33*</td>
<td>0.31*</td>
<td>−0.21*</td>
<td>0.63*</td>
<td>0.13*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign</td>
<td>−0.16*</td>
<td>0.15*</td>
<td>−0.16*</td>
<td>0.28*</td>
<td>0.31*</td>
<td>0.59*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>0.01</td>
<td>−0.25*</td>
<td>0.07*</td>
<td>−0.33*</td>
<td>−0.19*</td>
<td>−0.39*</td>
<td>−0.16*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public employed</td>
<td>0.11*</td>
<td>−0.22*</td>
<td>0.34*</td>
<td>0.26*</td>
<td>−0.27*</td>
<td>−0.18*</td>
<td>−0.26*</td>
<td>0.17*</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public salary</td>
<td>−0.03</td>
<td>0.24*</td>
<td>−0.19*</td>
<td>0.48*</td>
<td>0.19*</td>
<td>0.48*</td>
<td>0.56*</td>
<td>0.02</td>
<td>−0.21*</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Municipality contracts</td>
<td>0.22*</td>
<td>0.10*</td>
<td>0.18*</td>
<td>0.30*</td>
<td>0.03</td>
<td>0.24*</td>
<td>0.16*</td>
<td>−0.25**</td>
<td>−0.05*</td>
<td>0.22*</td>
<td></td>
</tr>
</tbody>
</table>

* $p < 0.01$. 

**Appendix**