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Local Entrepreneurship Clusters in Cities

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ABSTRACT

Entrepreneurial activity is significantly predicted by the presence of other entrepreneurs in the residential neighborhood. One plausible source of such spatial clustering is local social interactions, where individuals' decisions to become entrepreneurs are influenced by entrepreneurial neighbors. Using geo-coded matched employer-employee data for Sweden, we find that sharing residential neighborhood with established entrepreneurs has a statistically significant and robust influence on the probability than an individual leaves employment for entrepreneurship. An otherwise average neighborhood with a 5-percentage point higher entrepreneurial intensity, all else equal, produces between 6 and 7 additional entrepreneurs per square kilometer, each year. Our estimates suggest a local feedback-effect in which the presence of established entrepreneurs in a neighborhood influences the emergence of new local entrepreneurs. This supports the conjecture that social interactions constitute a mechanism by which clusters of entrepreneurship persist over time.

JEL: R12, R23, L26, J24

Keywords: entrepreneurship, clusters, peer effects, local social interactions, role models, neighborhood, social network externalities, path dependence

1. INTRODUCTION

Spatial variations in entrepreneurship are large and highly persistent over time (Fritsch and Wyrwich 2013, Andersson and Koster 2011). The persistence of entrepreneurship clusters is often taken as evidence of historically embedded regional 'entrepreneurship cultures'. The main intuition for this inference is simple: culture changes slowly, and so should phenomena dependent on it (cf. Williamson 2000). But while the role of local entrepreneurship cultures is generally acknowledged, less is known about the sources of such a culture and how it forms and persists over time.

This article aims to contribute to the understanding of these issues with a micro-econometric analysis of local social interactions in entrepreneurship. Social interactions constitute a mechanism by which local entrepreneurship persists over time. The reason is that they imply a feedback effect where localities with a high density of established entrepreneurs are more likely to breed new entrepreneurs. Using a detailed matched employer-employee database for Sweden, we test for such a feedback-effect with a micro-econometric framework in which individuals' decision to transcend from employment to entrepreneurship is modeled directly as a function of the density of established entrepreneurs in their residential neighborhood.

1.1 Social interactions, feedback effects and persistence in local entrepreneurship

Local social interactions refer to local non-market effects where individuals influence each other without any exchange of money (Glaeser 2000). They comprise a broad set of effects such as information spillovers and the influences that behaviors, attitudes and perceptions of local peers may have on an individual's choices and norms. There are at least three types of local social interactions effects explaining why a locality with a, for some reason, high density of established entrepreneurs is more prone to breed additional entrepreneurs and help to develop and maintain a favorable local entrepreneurship 'culture' (cf. Andersson and Henrekson 2014). First, a high density of entrepreneurs in a local environment may stimulate entrepreneurial behavior among its residents by inducing motivation and self-confidence, e.g., with reference to notions such as *"if they can do it, I can too"* (Sorenson and Audia 2000). Second, residents of a neighborhood may perceive that local entrepreneurs enjoy a high social status and are respected, which may trigger entrepreneurial endeavors (cf. Casson 1995). Third, a high local density of entrepreneurs implies a high local density of people with information and knowledge about the practice of entrepreneurship. This increases the probability that an individual acquire and develop entrepreneurial skills (Guiso and Schivardi 2011). For instance, Minniti (2005) maintains that social interactions with established entrepreneurs in a local milieu will reduce ambiguities and uncertainties about the practice of entrepreneurship and the startup process.

Social interactions thus constitute a mechanism for how the local "environment" influences individual behavior, which in turn feeds back on the same "environment", and imply that the local presence of established entrepreneurs stimulate new entrepreneurs. In fact, the type of social interaction effects discussed above suggest that entrepreneurship is self-reinforcing. As Minniti (2005, p. 3) puts it: *"... entrepreneurship creates a 'culture' of itself that influences individual behavior in its favor".* Social interactions thus exemplify how an initial stock of entrepreneurs in a region may reinforce local entrepreneurship by stimulating the emergence of a favorable local entrepreneurship 'culture' characterized by density of information for prospective local entrepreneurs and social norms which encourages and legitimize entrepreneurial activity.

Available empirical evidence of local social interaction effects in individuals' start-up decisions as well as their role in explaining spatial clusters of entrepreneurship still remains scant (cf. Falck et al 2012).[1] Analyses of social interactions are also bedeviled by identification problems. Manski's (1993) so-called 'reflection problem' holds that inferring local social interaction effects from geographic clustering of outcomes hinges crucially on the issue of separating the effects of social interactions from the effects of spatial sorting. -

We tackle the identification problems associated with social interactions in two main ways. First, we focus on the transition from employment to entrepreneurship and exploit the richness of our dataset to control for a large set of confounding factors at the level of individuals, prior employer and at the level of the neighborhood and region in which the individuals operate.[2] This addresses issues of selection on individual traits and underlying local characteristics. Second, we employ a novel and detailed empirical approximation of within-city neighborhoods, i.e. the area delineating the arena for social interaction effects.

[1]There are still many studies based on questionnaires and survey data where entrepreneurs are asked about the importance of role models (see e.g. Bosma et al. 2012). While these studies confirm that entrepreneurs often state that personal networks and peer influence is important, they are rather uninformative as regards the magnitude of these effects in quantitative terms (relative to other explanations) and few explicitly link peer effects in entrepreneurship to geographic outcomes, in particular clusters of entrepreneurs.

[2]For example, we account for size of individuals' employer, their type of job, years of schooling and type of education.

1.2 Using within-city neighborhood data to test for local social interactions in entrepreneurship

The data are geo-coded at a fine spatial resolution, which allows us to define residential neighborhoods as within-city squares of one square kilometer (1 km^2).[3] There are two main advantages of this in our empirical context. The first is that it alleviates identification. The within-city neighborhood data implies that we have within-city variance in entrepreneurship outcomes. We are thus able to control for city-level factors and identify social interaction effects by exploiting variance across neighborhoods within cities. This improves identification because intra-city variance in entrepreneurship cannot be explained by city-wide fundamentals, since those are shared by all neighborhoods in the city. The idea of exploiting within-area variance to identify social interactions is not new (Bertrand et al 2000, Giannetti and Simonov 2009), and builds on the premise that the different neighborhoods of a city or region should be homogeneous with regard to important fundamentals. The main advantage of the small-scale neighborhoods in our analysis is that they are homogeneous with regard to any determinant operating at the city (or municipality) level.

Many traditional demand- and supply-side factors explaining entrepreneurship, such as market-size, population growth and availability of skilled workers, are indeed likely to operate at the city-level.[4] For example, it is difficult to conceive of an entrepreneur starting a business in a city based on the availability of skilled workers, input suppliers or market-size in his residential neighborhood of one square kilometer.[5] For such factors, the wider city (or even the larger labor market region) is more likely to be the relevant scale. After all, cities constitute integrated economic areas, within which customers and workers are highly mobile. Variations in start-up propensities across neighborhoods in cities are thus not likely to depend on differences in such standard supply- and demand-side determinants since they are expected to mainly operate at a scale larger than the immediate neighborhood.

The second advantage of our approximation of neighborhoods is that it comes much closer to the conceptual notion of a neighborhood as an arena for social interactions. The spatial scale of our definition of neighborhoods (1 km^2) corresponds to established findings with regard to the geography and distance-decay of inter-personal contacts and local communities. For example, urban sociologist

[3]This is a substantially finer spatial resolution than in any other studies of local peer effects in entrepreneurship that we know of.

[4]Swedish municipalities have a local government whose regulations may have a major influence on start-up decisions. As an example, according to the yearly business climate index by the Confederation of Swedish Enterprise, the variation in attitudes of local authorities and the bureaucracy associated with establishment of new plants across municipalities is quite substantial (cf. Westlund et al 2014).

[5]An exemption to this is of course sectors for which the main market is the immediate local neighborhood, such as local cafés and hairdressers. This is an issue we deal with in our robustness analyses.

Barry Wellman has in a series of studies shown that contacts tend to be localized. One of his findings is that 42% of frequent contacts occur between individuals who live less than 1 mile apart (Wellman 1996).[6] Glaeser and Sacerdote (2000) use data from the General Social Survey (GSS) in the US and report that a similar pattern. They find a correlation between the frequency with which one sees a friend, and the distance to that friend of -67%, and a corresponding association between distance to a relative and the frequency of visiting that relative of -73%. Social interactions are thus likely to exhibit sharp distance decay, rendering within-city residential neighborhoods relevant arenas to test for social interactions (Glaeser 2000, Durlauf 2004). It should be noted that social interaction effects do not require any direct social network and communication between people. While information spillovers could certainly be expected to necessitate social ties and communication, effects pertaining to motivation from observing success of others have more to do with sight or hearing. Both types of social interaction effects are still facilitated by proximity.

In terms of the empirical approach and overall design, our paper is akin to recent analyses by Giannetti and Simonov (2004, 2009). They also focus on social interactions in entrepreneurship and employ sample household data for Sweden covering about 4% of the country's population. To proxy neighborhoods they use municipalities, which is a crude proxy given that the median areal size of Swedish municipalities is about 900 square kilometers.[7] The use of municipalities also entail the identification problems described above, which the authors address using instrumental variables and municipality-level controls. They find evidence that social interactions effects stimulating individuals to transcend to entrepreneurship.

The current paper differs in several respects. Most importantly, our neighborhood proxy and definition of the arena for social interactions are completely different. We also employ full population, matched employer-employee data allowing us to include controls for a larger set of confounding factors. We also follow the identification strategy of Lindbeck et al (2007) in isolating sub-groups, such as age cohorts, immigrants and movers, providing tests of robustness of the results with regard to the underlying identifying assumption.

[6]An objection may be raised in view of the cited result of Wellman (1996) being based on data pre-dating the internet and web-based social media. If such media substitutes contacts face-to-face it may mean that in modern times, frequent contacts are less localized. Available evidence yet points to that web-based interactions do not substitutes face-to-face contacts, and that frequent internet contacts also are localized (see e.g. Gaspar and Glaeser 1998, Wellman et al 2001, Boase et al 2006).

[7]The areal size of Swedish municipalities ranges from about 8.5 to over 19,000 km^2, which is clearly larger than neighborhood conceptualized as an arena for social interactions. This definition of neighborhoods is not only conceptually problematic. It also aggravates identification because large administrative areas are often far from homogeneous, which complicates identifying social interactions as a cause of inter-municipal variation in start-up decisions.

1.3 Summary of main results

We first document a, to our knowledge, previously unremarked clustering of entrepreneurs at the level of neighborhoods. We show that the intensity of entrepreneurs varies substantially across neighborhoods within one and the same city. In the city of Stockholm, for instance, there is a small core of neighborhoods where the fraction of residents that are entrepreneurs is in excess of 25%, or about four times the fraction of entrepreneurs in the city as a whole. Within-city neighborhood clusters of entrepreneurs are a generic phenomenon across cities, and reflect an empirical regularity consistent with local social interactions in entrepreneurship.

We then show that the fraction of established entrepreneurs in a neighborhood has a positive and statistically significant effect on the probability that an individual leaves employment for entrepreneurship. The estimated effect is remarkably robust. Even after controlling for a number of individual, employer, neighborhood and region characteristics that could influence the probability that an individual transcend to entrepreneurship, the estimated influence of the intensity of entrepreneurs in the neighborhood is statistically and economically significant. Furthermore, this effect is robust across age cohorts, remains when we consider immigrants and movers, and is also robust to our definition of entrepreneurship. These results are consistent with neighborhood social interaction effects being important in stimulating individuals' to become entrepreneurs. Our estimates imply a feedback-effect where the local presence of established entrepreneurs in a neighborhood influences the emergence of new local entrepreneurs. We interpret our findings as providing robust empirical support for that persistent local clusters of entrepreneurship may indeed be explained by that a local culture has developed in which entrepreneurial behavior reinforces itself though local social interactions.

1.4 Outline

The remainder of the paper is organized as follows: Section 2 provides a brief background. Section 3 presents the data and documents local clusters of entrepreneurs at the neighborhood level. It illustrates the skewness of the fraction of entrepreneurs across neighborhoods within regions using the two city-regions as cases in point. Section 4 presents the identification strategy, defines variables and presents main results. In Section 5 we undertake various robustness tests of the results of the baseline model specification and Section 6 concludes.

2. LOCAL SOCIAL INTERACTIONS, CULTURE AND ENTREPRENEURSHIP

The notion of a local entrepreneurship culture figures prominently in the literature on geographic clusters of entrepreneurship (Beugelsdijk 2007, Davidsson and Wiklund 1997, Andersson and Koster 2009, Fritsch and Wyrwhich 2013, Westlund et al. 2014). It is for example a central argument in Saxenian's (1994) highly influential analysis of the roots of the divergent development paths of the Silicon Valley region in California and the Route 128 corridor outside Boston. One of her main conjectures is indeed that Silicon Valley's success vis-à-vis Route 128 is to be found in the stronger entrepreneurial culture (or climate) prevailing in the former region.

In general terms, a local entrepreneurship culture refers to the social acceptance and encouragement of entrepreneurs and their activities that permeate a locality (cf. Etzioni 1987, Fritsch and Wyrwhich 2013). From this perspective one may think of a local entrepreneurship culture as a form of local informal institution.[8] This type of institutions is typically described as being historically rooted, and evolves and changes in slow processes over time. Williamson (2000) considers informal institutions to be a top-level institution "where the norms, customs, mores, traditions, etc., are located" (ibid. p.596), and whose time scale of change is slow.

The literature yet remains rather vague about the mechanisms by which a local entrepreneurship culture emerges and is sustained over time. Any discussion of these issues should naturally depart from micro-founded arguments of how individuals' attitudes towards entrepreneurship and their inclination to become entrepreneurs are developed in interaction with the local environment. The literature on social interactions offers such a framework.

2.1. Social interactions and persistent spatial heterogeneity in outcomes

Social (non-market) interaction mechanisms occur whenever individuals' behavior depends on the behavior of others without any exchange of money (Glaeser and Scheinkman 2003). Theoretically they are often described as pure externalities in that they pertain to more or less effortless transmission of ideas, information or norms between individuals (Glaeser 2000).

Social interactions are interesting in the context of geographic clustering as they have been shown to constitute an important explanation of persistent spatial clusters of various economic and socio-economic outcomes across areas with apparently similar outsets, such as neighborhoods within a city.

[8]There are many different concepts in the literature that generally refer to an entrepreneurship culture (Beugelsdijk 2007). For example, Audretsch and Keilbach (2005) introduce the concept of entrepreneurship capital as a subset of a region's social capital. Westlund and Bolton (2003) discuss local social capital as a fundamental driver of local entrepreneurship.

Scheinkman (2008) argues that social interactions are able to explain "… a pervasive problem in the social sciences, namely the observation of large differences in outcomes in the absence of commensurate differences in fundamentals" (ibid, p.2). The rationale is that social interactions imply a local feedback process, where peers influence individuals, whom in turn influence others. Put differently, social interactions exemplify how the "environment" influences individual behavior, which in turn feeds back on the same "environment". This feedback process is essentially a network effect, which generate persistence in the form of sensitivity to initial conditions and shocks, and consequent (spatial) multiple equilibria. The feedback process also has policy ramifications as it implies a *social multiplier* (Glaeser et al 2003). An exogenous shock induces not only a direct effect on individual behavior, but also an indirect effect mediated by people adopting the behavior of their peers. As a result, social interactions may amplify the direct effects of a policy, both in terms of scope and durability.

2.2. Social interactions in entrepreneurship and clusters of entrepreneurs

These characteristics of social interaction effects provide arguments for that a local cluster of entrepreneurs may form and reinforce itself as a consequence of social interactions in entrepreneurship. Minniti (2005) presents a stochastic type of agent-based model of entrepreneurship clusters with exactly these features. She shows that a relatively simple assumption of social interaction effects (which she calls non-pecuniary social network externalities), whereby agents follow social cues and are influenced by local entrepreneurial peers in their decision to start a firm, suffices to generate persistent differences in entrepreneurship across communities that have similar initial characteristics. This is a prediction shared with the more general literature on social interactions (cf. Scheinkman 2008).

Although the literature on entrepreneurship has for a long time recognized the role of the social environment in explaining the decision to become an entrepreneur (Licht and Siegel 2006, Davidsson and Honig 2003), empirical evidence on social interactions as a phenomenon is rather limited. Bosma et al (2012) maintain that existing evidence comes from three main sets of findings: (i) the decision to become an entrepreneur is positively associated with having entrepreneurs in one's social network (Kim and Aldrich 2005, Klyver et al 2007), (ii) there is a positive influence of having parents who are (or have been) entrepreneurs (Chlosta et al 2012, Dunn and Holtz-Eakin 2000), and (iii) entrepreneurial behaviors of school and workplace peers influence entrepreneurial behavior (Falck et al 2012, Nanda and Sorensen 2010). While affirmative of the role of social interactions in entrepreneurship, few of the existing studies focuses explicitly on the role of social interactions as a source of spatial clusters of entrepreneurs.

The analyses in this paper fill a gap in the literature by focusing on social interaction effects in entrepreneurship operating at the level of residential neighborhoods within cities. In particular, we add to the still limited set of analyses that study clusters of entrepreneurs in neighborhoods and test for social interaction effects using a micro-econometric framework in which individuals' decision to transcend to entrepreneurship is modeled directly as a function of the behavior of the local peers. We also employ a precise definition neighborhoods which a) is consistent with the large and established literature emphasizing the residential neighborhood as an important arena for social interactions (Glaeser 2000, Durlauf 2004) and b) facilitates identification.

3. CLUSTERS OF ENTREPRENEURS WITIN CITIES

3.1 Data and definition of neighborhoods

The basic data source is a matched employer-employee audited register dataset for Sweden, maintained by Statistics Sweden (SCB). These data track all Swedish individuals aged 25-64 in 2007, and inform on an extensive set of basic observables, such as age, sex, wage, immigration status, and education. The dataset also allows us to identify entrepreneurs. Entrepreneurs are defined as individuals who are self-employed whether through a sole proprietorship or an incorporated business. Their firms may or may not have any employees. We also know who had this status in 2008, allowing us to assess the startup decision between these two years.

Detailed geo-coding of individuals' places of residence allows us to pinpoint each person to a single square in a larger square grid, covering all city-areas, where each square is exactly one square kilometer. City-areas are defined by SCB as places with at least 200 inhabitants and a maximum distance of 200 meters between houses.[9] We use these squares to empirically approximate neighborhoods. The set-up makes it possible to aggregate any individual or work place characteristic to the level of spatial squares, including the number of entrepreneurs. The total number of residential squares with at least 50 inhabitants in 2007 amounts to 8,588 and these comprise about 3.8 million people in the age interval 25-64. The finalized dataset also excludes people who are not employed, people in agriculture, fishing and "primary" industries or where we lack information on the workplace in 2007.[10] Naturally, we also exclude people who are already running their own businesses, and people for whom we lack data in 2008. These steps result in a dataset tracking about 2.7 million individuals.

3.2 Neighborhood clusters of entrepreneurs

How are entrepreneurs distributed across neighborhoods in a city? A key feature of models of local peer effects is that they predict persistent heterogeneity in outcomes even in the absence of corresponding differences in fundamentals (Scheinkman 2008). Under the assumption that at least part of the relevant fundamentals for entrepreneurs operate at the city-level and are thus shared by all neighborhoods in the city, then clusters of entrepreneurs at the neighborhood level within a given city is an outcome consistent with local social interaction effects in entrepreneurship (cf Minniti 2005). In this section we show that there are significant within-city clusters of entrepreneurs.

[9] Neighborhoods with fewer than 50 residents are excluded from the analysis.
[10] The reason we exclude these types of industries is because, in these industries, it is commonplace to run one's own business and start it close to established businesses (such as that of the parents), i.e. for reasons other than those we are seeking to identify.

Figure 1 illustrates the variation in the fraction of entrepreneurs across all neighborhoods with at least 50 inhabitants[2] (squares of 1km), in city-areas. For each neighborhood *j*, the fraction of residents that are entrepreneurs is defined as follows:

$$Fraction_j = \left(\frac{\sum_{i=1}^{n} Entr_{i,j}}{n_j} \right) \quad (1)$$

where $Entr_{i,j}$ is a dummy variable indicating whether individual *i* in neighborhood *j* is an entrepreneur (1), or not (0). n_j denotes the total number of residents in neighborhood *j*. All neighborhoods (*N*=8,588) are ranked in descending order with respect to their fraction of entrepreneurs (vertical axis), and the solid blue line represents the average for Sweden. In Sweden as a whole, about 7% of the labor force is full-time entrepreneurs in the sense that their employment status is either a sole proprietorship or owner of an incorporated business. The variance across neighborhoods is yet substantial. There is a substantial degree of heterogeneity across neighborhoods and the red line shows a typical *S*-shape. The observed differences are not scale-driven: there is no clear tendency for highly entrepreneurial neighborhoods to be more sparsely (or densely) populated than less entrepreneurial neighborhoods.

The differences in the fraction of entrepreneurs across neighborhoods in Sweden may be expected in view of the large literature on the geography of entrepreneurship, documenting sharp differences in start-up rates across cities (Armington and Acs 2002, Glaeser 2007). Cities differ in terms of supply- and demand-side determinants of entrepreneurship, and variations in the fraction of entrepreneurs across cities may be appreciated as an outcome of this, i.e. neighborhoods in cities with better conditions for entrepreneurship have high fractions of entrepreneurs.

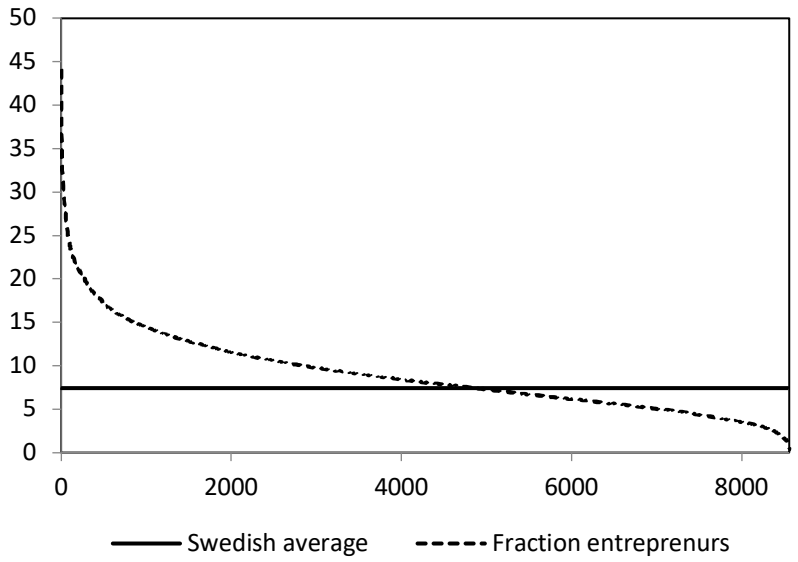

Figure 1. The fraction of entrepreneurs across neighborhoods in Sweden.

Note: *the vertical axis displays the fraction of entrepreneurs (in percent) on the neighborhood (1 km² square) level. The neighborhoods are then plotted in descending order from left to right.*

The variation in the fraction of entrepreneurs across neighborhoods *within* one and the same city is still substantial. Figure 2 displays within-city clustering of entrepreneurs in the Stockholm metropolitan area, as well as in the Jönköping urban region. Stockholm is the main metropolitan area in Sweden (population about 2.13 million), while Jönköping is a mid-sized city region (population about 130,000). These are two rather different types of cities and they serve as an illustration of the case in point. The dots on each map show the level of the fraction of entrepreneurs of each neighborhood in the respective cities.

The maps illustrate that the Stockholm and Jönköping city-regions show a similar pattern: the intensity of entrepreneurs varies substantially across neighborhoods within the cities. While Stockholm is displaying clusters to the north-east, Jönköping exhibits occasional hotspots in the city center near the southern shores of lake Vättern and also a cluster of highly entrepreneurial neighborhoods in the city of Gränna in the north-east. In both cities, the variation in the fraction of entrepreneurs across neighborhoods is substantial, and in an order of magnitude similar to that prevailing across neighborhoods in Sweden as a whole.

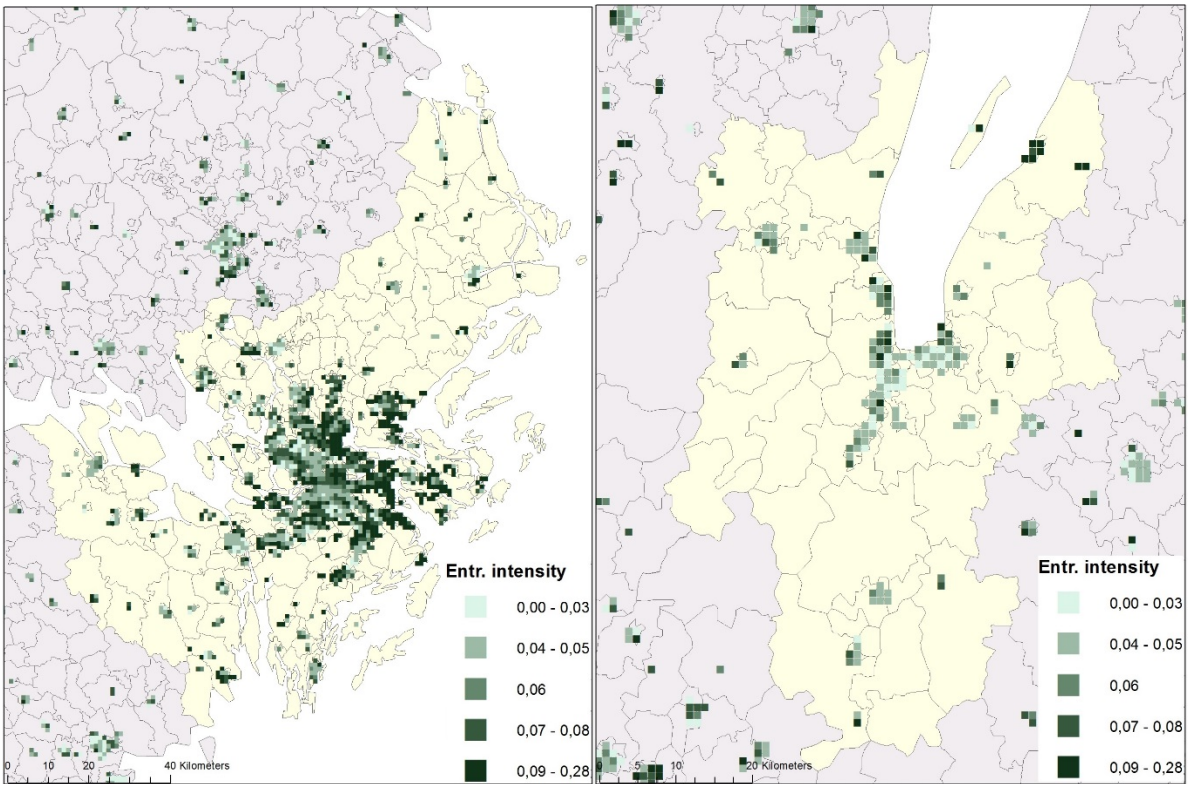

Figure 2. Distribution of entrepreneurs within the Stockholm metropolitan area (left), and the Jönköping urban region (right).

Note: *The neighborhood squares are shaded according to the number of entrepreneurs, relative to the total number of residents per neighborhood, as represented by 1 km² squares. The shade indicates the quintile to which the neighborhood belongs in terms of entrepreneurial intensity, from dark (high) to pale (low). Neighborhoods with fewer than 50 residents are excluded.*

This picture is reinforced by reproducing Figure 1 for the two cities which is done in Figure 3. The left panel shows the variation in the fraction of entrepreneurs across neighborhoods within the city of Stockholm, and the right panel shows a corresponding graph for Jönköping. The upper tail values differ slightly between the two cities, but the overall picture is palpably similar; both with respect to each other and with respect to the nation as a whole (Figure 1).

The curves start out steep around 30 percent, then levels off, and becomes steeper again around the 3-4 percent mark. Within each city, there are significant local clusters of entrepreneurs in the form of neighborhoods where the fraction of residents that are entrepreneurs is significantly larger than elsewhere in the city. Again, these patterns are not driven by scale where some neighborhoods have high fraction of entrepreneurs just because they are small and thereby a small denominator.[11]

[11]In the city of Stockholm, for instance, the mean population size of the five neighborhoods with the highest fraction of entrepreneurs is 94.2 whereas the same figure for the five neighborhoods with the lowest fraction entrepreneurs is 96.4.

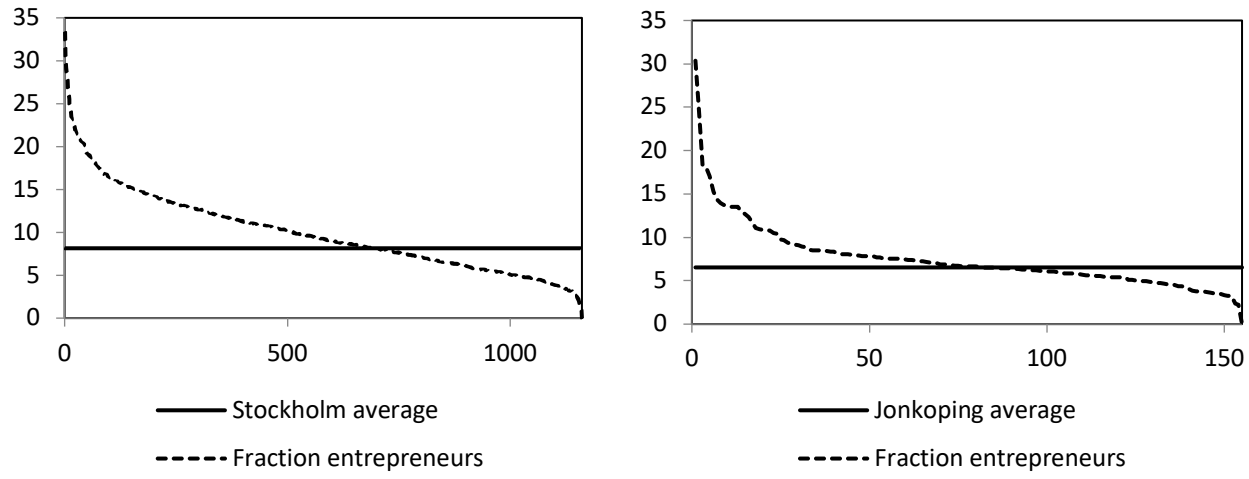

Figure 3. The fraction of entrepreneurs across neighborhoods in Stockholm (left) and Jönköping (right).

Note: *The vertical axis displays the fraction of entrepreneurs (in percent) on the neighborhood (1 km² square) level. The neighborhoods are then plotted in descending order from left to right.*

To further verify the prevalence of within-city clusters of entrepreneurs, we estimate a Logit model with the entrepreneurial status of each individual on the left hand side and the fraction of entrepreneurs the residential neighborhood on the right hand side. This estimation informs whether the probability that an individual is an entrepreneur is associated with the fraction of entrepreneurs residing in the same neighborhood. A statistically significant coefficient for the neighborhood entrepreneur variable indicates general co-location of entrepreneurs across neighborhoods. Since our aim is simply to illustrate a co-location phenomenon and not inference, we do not include any control variables. Table 1 reports the results.

Table 1. Co-location of entrepreneurs within neighborhoods. The parameters are estimated using a Logit model. Dependent variable: dummy (1 if entrepreneur in 2007 and 0 otherwise).

Fraction entrepreneurs in neighborhood	.133*** (.000914)
Observations	3,072,329
Pseudo R-squared	.019

Note: Standard errors in parentheses. *** p < .01.

It is clear that entrepreneurs tend to live in the same neighborhoods as other entrepreneurs. The probability that an individual is an entrepreneur is positively and statistically significantly associated with the fraction of entrepreneurs in her residential neighborhood.

4. NEIGHBORHOOD PEER EFFECTS IN ENTREPRENEURSHIP

Baseline model

Are neighborhood social interaction effects in entrepreneurship an empirically relevant source of the regularity of within-city clusters of entrepreneurs? To test this, we model individuals' decisions to switch from employment to entrepreneurship by becoming a full-time entrepreneur. We restrict the sample to individuals that are full-time employees in 2007 (N= 2,719,697), and set up a Logit model with which we estimate the influence the fraction of entrepreneurs in an individual's residential neighborhood has on the probability that she switches from employment to entrepreneurship between years 2007 (t-1) and 2008 (t). Formally, the baseline empirical model is given by:

$$\Pr\left(E_{i,t}=1\middle|\mathbf{x_{i,t-1}}\right)=\frac{\exp\left(\mathbf{x'_{i,t-1}\Gamma}\right)}{1+\exp\left(\mathbf{x'_{i,t-1}\Gamma}\right)}$$

(2)

$$\mathbf{x'_{i,t-1}\Gamma}=\alpha+\underbrace{\mathbf{I'_{i,t-1}\beta}}_{Individual}+\underbrace{\mathbf{Z'_{i,t-1}\gamma}}_{Employer}+\underbrace{\mathbf{\Omega'_{i,t-1}\theta}}_{Neighborhood}+\underbrace{\mathbf{R'_{i,t-1}\sigma}}_{Region}+\varepsilon_{i,t}$$

where $E_{i,t}$ is a dummy variable which is 1 if individual i switched from employment to entrepreneurship between years t-1 and t. Entrepreneurs are identified based on information of sole proprietorship or ownership of an incorporated business. **I** is a vector of individual characteristics, **Z** a vector of characteristics of the individual's employer and work in t-1, **Ω** a vector of neighborhood characteristics and **R** a vector of regional characteristics. Our main focus is on the influence of a specific variable in **Ω**, namely the fraction of entrepreneurs (see Equation 1).[12] The general idea is straightforward: individuals residing in neighborhoods where a high fraction of the residents are entrepreneurs dwell in a more entrepreneurial local social environment with higher odds for social interaction effects in entrepreneurship. This should manifest itself in that the density of entrepreneurs in the neighborhood matters over and above individual characteristics in the decision to become an entrepreneur, i.e. individuals with otherwise similar traits should show different propensities to engage in entrepreneurship depending on the type of neighborhood they live in.

Identification strategy

A key issue in inferring peer effects from this empirical set-up is whether we are able to deal with the possibility non-random spatial sorting of individuals on entrepreneurial skills or ambitions across neighborhoods. A positive effect of the fraction entrepreneurs in the residential neighborhood on the

[12]In the estimations, we make slight change in how the fraction of entrepreneurs in a neighborhood is defined. We substract 1 from the denominator, i.e. (n_j -1) instead of n_j (cf. equation 1). The reason for this is that we want the fraction to be based on residents other than the individual in question.

probability of starting a business may be an artifact of selection. Individuals with entrepreneurial skills may have preferences for certain underlying neighborhood amenities or characteristics, which could mean that they cluster at the neighborhood level. Entrepreneurs are for example often described as "footloose" (Pflueger and Süedekum 2008), who can choose locations more freely than employees as they take their business with them. This raises the possibility of stronger amenity-oriented motives in the residential location decision (Johnson and Rasker 1995, Wenting et al 2011). A further issue is that individuals may be stimulated to become entrepreneurs by other neighborhood characteristics than the intensity of established entrepreneurs. Economic characteristics of the region to which a neighborhood belongs as well as the fraction of highly educated neighbors, not necessarily entrepreneurs, could for instance have a significant influence on entrepreneurial decisions.

We deal with these issues in four main ways. The first is through the empirical design itself. By focusing on individuals that leave employment for entrepreneurship we estimate parameters based on an observed active choice to engage in entrepreneurship, which reduces issues of sorting. An alternative could for example be to estimate a fully specified model of the probability that an individual is an entrepreneur (cf. Table 1). Such an approach is nevertheless more indirect and plagued by stronger issues of sorting because established entrepreneurs could move across neighborhoods while maintaining their business. The second way in which we deal with identification is by controlling for an extensive set of theoretically motivated controls at the individual, employer/work, neighborhood and regional levels. We include such controls in order to account for spatial sorting on individual characteristics as well as confounding factors at the neighborhood and regional level.

Third, as stated in the introduction, we observe differences in entrepreneurship between neighborhoods within one and the same city. These intra-city differences cannot be explained by either differences in formal and informal policy institutions or by city-wide economic fundamentals. Neighborhoods in the same city are exposed to the same city policies and economic characteristics. It follows that some other factor than policy institutions and basic demand- and supply-side characteristics should drive variations in the intensity of entrepreneurs across residential neighborhoods.

Fourth, we undertake a number of robustness tests of our baseline estimations. In particular, we follow the strategy of Lindbeck et al (2007) and test whether our results are robust to estimations with sample of sub-groups of individuals, where each partition is based on different identifying assumptions. A positive and significant influence of the fraction of entrepreneurs in the neighborhood on the probability to transcend to entrepreneurship that is robust to our set of controls and robustness tests provide support for the hypothesis of social interactions in explaining local clusters of entrepreneurs.

4.1 Variables and descriptives

The variables and their definitions are reported in Table 2 whereas summary statistics are presented in Table 3.

Individual characteristics

We include a number of standard worker characteristics that may influence entrepreneurship: age, gender, immigration status, years of schooling, education specialization, marriage status, and information on children in the household. Previous findings for Sweden suggest that the propensity to become full-time self-employed rises with age though at a diminishing rate (Andersson et al 2012). Gender is an important innate characteristic with a strong influence on entrepreneurial behavior, where males are consistently found to be more prone to switch to full-time self-employment (Blanchflower and Oswald 1998). We further control for immigrant status with a dummy for non-native individuals.

Better educated individuals are typically more mobile in the labor market (Anderson and Thulin 2013), and the general finding in the literature is that the likelihood of switching to entrepreneurship rises with education (Rees and Shah 1986). One explanation for this is that education proxy human capital and absorptive capacity, and better educated individuals may be in a better position to identify and act on entrepreneurial opportunities. This effect is however dependent on education specialization: Klaesson and Larsson (2014) show on Swedish data that entrepreneurial activity differs substantially by education specialization, presumably since some industries (e.g. humanities and arts) are dominated by rather powerful push factors. Since like-minded people may share neighborhoods, the added controls for education specialization appear as particularly motivated in our empirical context.

Further, we include two categorical controls for life-cycle related factors: whether an individual is married (including domestic partnerships), and whether or not the individual has children living at home. These control variables are motivated for at least two reasons. First, the literature on the marriage premium generally finds that marriage has implications for the "division of labor", resulting in higher earnings for self-employed men (Hundley 2000). If married people tend to sort themselves to similar neighborhoods and are more prone to running their own firms, this nuisance will result in biased coefficients in the absence of this control. Second, many entrepreneurs operate from home (cf. Mason et al 2011), and people who live in single-family houses to presumably be more prone to starting new businesses. Home owners are also likely to have greater possibilities to finance a start-up since they can use their ownership of a house (or apartment) as collateral to fund their businesses through mortgage. Unfortunately, we lack data on home ownership and on residential types per neighborhood (i.e. whether dwellings are owned or not). However, previous research shows that home ownership is strongly associated with being married and having children (Feijten and Mulder 2005,

Mulder and Wagner 1998, Clark and Dieleman 1996). By controlling for family status, we thus address the issue of homeownership, and we expect that both having children and being married is positively associated with leaving employment for entrepreneurship.

Work characteristics

Six variables are included to capture the influence of individuals' employer and job characteristics on their decision to transcend to entrepreneurship. The first two are the employment size of the establishment at which the individual was employed in 2007 and a dummy denoting whether the establishment closes down between *t*-1 and *t*. Establishment size is an important control as several studies show that firm size is negatively associated with employees leaving for entrepreneurship (Hyytinen and Maliranta 2008, Elfenbein et al. 2010). The argument is that employees of smaller firms are exposed to the whole business process including customers, making them better equipped to start a firm. The dummy for establishment closure is intended to capture whether individuals are pushed into entrepreneurship.

We further control for wage income, tenure, industry and occupation. The wage income at the current employer may be appreciated as an opportunity cost for self-employment, which means individuals with better pay in their current job should be less likely to leave for entrepreneurship. Tenure is defined as the length the employee has remained with the same employer. The longer tenure, the greater the likelihood that it is a good match and we thus expect tenure to have a negative influence on the decision to leave the job for entrepreneurship (cf. Farber 1994). To account for that the propensity to transcend to self-employment may also be related to the prior job and industry, we further include occupational and industry dummies defined in *t*-1.

Neighborhood variables

Our main variable of interest is the fraction of entrepreneurs in the neighborhood in which an individual lives. This variable is defined as the number of entrepreneurs in the neighborhood normalized by the total neighborhood residents of working age.[13] The intuition is that the higher the intensity of entrepreneurs in a residential neighborhood, the higher the likelihood that a resident of that neighborhood interact with and is influenced by an entrepreneurial peer. We also include the squared term of the fraction of entrepreneurs. The marginal effect of the density of entrepreneurs is likely to be non-linear and fall off when the density rises. It is conceivable that there is a 'threshold density' at which the density of entrepreneurs is large enough to maintain a local culture through peer effects. Above such a threshold, additional entrepreneurs in the neighborhood adds little.

[13]As this variable is defined for each individual, we subtract the individual in question from the calculation.

Table 2. Variables in the empirical analysis.

		Description
	Startup ($E_{i,t}$)	*Dummy, denoting whether the worker decided to become an entrepreneur (1) in 2008, or not (0).*
Individual characteristics	Years of schooling	Number of (theoretical) years to complete the worker's highest achieved level of education.
	Immigrant (dummy)	Dummy, denoting whether the worker has emigrated from another country (1), or is a native-born Swede (0).
	Age (ln)	The worker's age in 2007.
	Age squared (ln)	The squared value of the age variable.
	Male (dummy)	Dummy indicating whether the worker is male (1) or female (0).
	Education specialization	A set of 10 dummies, indicating the type of education associated with each worker's highest achieved level of education.
	Married	Dummy indicating whether the worker is married (1), or not (0). The variable is also set to 1 for workers in domestic partnerships.
	Children at home	Dummy indicating that the worker has children registered as living in the same residence.
Job and workplace variables	Establishment size (ln)	Number of employees in the same work establishment.
	Establishment exit	Dummy, denoting whether the work establishment in 2007 has discontinued its operations before the next reporting period (2008).
	Wage (ln)	The workers yearly wage, in Swedish Kronor, in 2007.
	Tenure	Number of consecutive years that the worker has spent with the same employer. Measured since 1991.
	Occupation	1 digit ICSO-88 standard, denoting the worker's occupation.
	Industry	2 digit industry dummies of the employer
Neighborhood variables	Fraction entrepreneurs	The number of established entrepreneurs relative to working-age individuals, excluding individual *i*.
	Fraction entrepreneurs squared	The square of fraction of entrepreneurs
	Density (ln)	Number of working-age individuals in the same neighborhood.
	Human capital	The number of individuals with the equivalent of a bachelor's diploma, relative to the number of working-age individuals, excluding the individual in question.
	Neighborhood income	Mean income of residents in the neighborhood, excluding the individual in question. This variable is used in the robustness section.
City-wide controls	Municipality entrepreneurship	The fraction of entrepreneurs in the municipality to which the neighborhood belongs, excluding the population in the neighborhood.
	Region heterogeneity	Dummies for each local labor market region

We control for three other neighborhood characteristics in the baseline model. The first is neighborhood density, which is simply the total number of residents in the neighborhood of working age.[14] This overall neighborhood density can be seen as a 'catch-all' variable, capturing local agglomeration effects and characteristics of the built environment. We also include the fraction of residents with a long university education ($\geq$ 3 years) and the average income level in the

[14]Neighborhoods are spatial squares of one square kilometer. The number of residents in a neighborhood is therefore and 'exact' measure of resident per square kilometer, i.e. a standard measure of density.

neighborhood. Both measures are based on residents other than the individual it is measured for. These variables are intended to reflect neighborhood characteristics that could disproportionately attract people with entrepreneurial skills (the sorting argument) as well as could generate local knowledge spillover phenomena that influence start-up decisions. A large literature indeed shows that there is typically local clustering within cities based on both income and education (Jargowsky 1996). Many entrepreneurs and business owners have indeed a long university education and are found in the higher income brackets. Furthermore, environments with density of human capital (proxied by people with a university degree) may also boost human capital externalities that could stimulate new firm formation (Acs and Armington 2004, Genniaoli et al 2013).

Region- and city-wide controls

We further include the fraction of entrepreneurs in the city, i.e. municipality, as a whole, subtracting the residents in the neighborhood in which the individual lives. There are two motivations for this variable. First, it captures social interaction effects at a level wider than the neighborhood. Second, it could reflect the general conditions for entrepreneurship in the municipality to which the neighborhood belongs. We further include dummy variables for each local labor market region.[15] These are intended to capture differences in region-wide characteristics that may influence entrepreneurial decisions of their inhabitants. The inclusion of the variables at the level of municipalities and local labor markets implies that the marginal effects of the neighborhood variables above are identified from variance across neighborhoods, holding the city- and region-level characteristics constant.

[15]Local labor market regions consist of a number of municipalities with spatially integrated labor markets, as evidenced by the intensity of commuting flows and are defined by Statistics Sweden.

Table 3. Summary statistics.

Variable	Mean	Std. Dev.	Min	Max
Entrepreneur (dummy)*	.05	.22	0	1
Startup (dummy)	.01	.08	0	1
Entrepreneurship share (neighborhood)	.05	.02	.00	.28
Neighborhood density (ln)	4.03	1.18	0	7.4
Human capital (neighborhood)	.20	.10	0	.65
Years of schooling	12.49	2.63	6	22
Tenure	7.31	5.68	1	17
Wage (ln)	7.82	.67	0	12.5
Establishment exit	.02	.15	0	1
Establishment size (ln)	4.62	2.82	0	14.9
Age	43.84	1.99	25	64
Male (dummy)	.49	.50	0	1
Immigrant (dummy)	.16	.37	0	1
Education: general	.08	.28	0	1
Education: pedagogy	.04	.19	0	1
Education: humanities and arts	.19	.40	0	1
Education: Social sciences and law	.03	.18	0	1
Education: Natural sciences and computer science	.23	.42	0	1
Education: Engineering and manufacturing	.01	.09	0	1
Education: health and social care	.16	.37	0	1
Education: agriculture and animal care	.06	.23	0	1
Education: services	.02	.14	0	1
Married	.47	.50	0	1
Children at home	.53	.50	0	1
Entrepreneurship share (city-wide)	.07	.02	.03	.20

Note: N=2,719,697. The "married" variables include domestic partnerships, as outlined in table 2. * This variable is based on individuals in the relevant age interval, and who are living in neighborhoods of at least 50 people per square kilometer, as opposed to all other variables in the table, which are restricted to individuals registered as employed in November of 2007.

4.3 Results

Table 4 presents the results from a Logit estimation of a baseline version of the model in (1). The baseline model includes the variables listed in the results table, as well as dummies for education specialization, occupation (1-digit ISCO-88) and industry of work (2-digit NACE). Robustness tests of the results obtained with the baseline model are presented in Tables 5-8.

The estimates provide support for the hypothesis that there are local social interactions in entrepreneurial behavior, as manifested by a feedback effect where a high density of local established entrepreneurs breeds new entrepreneurs. Individuals residing in neighborhoods with a higher intensity of role models, and a presumably favorable 'entrepreneurial climate', indeed show a greater likelihood of transcending from employment to entrepreneurship. We further find that the squared fraction of entrepreneurs has a negative influence, which is consistent with a threshold effect, i.e. the higher the fraction of entrepreneurs, the lower the marginal effect.

Table 4. Determinants of leaving employment for entrepreneurship.

Variable	Coefficient estimate
Entrepreneurship share (neighborhood)	0.159***
	(0.0102)
Entrepreneurship share (neighborhood, squared)	-0.00541***
	(0.000654)
Neighborhood density (ln)	-0.000661
	(0.00831)
Human capital (neighborhood)	1.042***
	(0.0981)
Entrepreneurship share (city-wide)	0.00283
	(0.00600)
Years of schooling	0.0315***
	(0.00433)
Tenure	-0.0192***
	(0.00180)
Wage (ln)	-0.522***
	(0.00894)
Age	0.0669***
	(0.00668)
Age squared	-0.000646***
	(7.52e-05)
Male (dummy)	0.872***
	(0.0202)
Immigrant (dummy)	0.00472
	(0.0211)
Establishment exit	0.0885***
	(0.0340)
Establishment employment size (ln)	-0.400***
	(0.00904)
Married	0.158***
	(0.0169)
Children at home	0.148***
	(0.0178)
Pseudo R2	0.15
Observations	2,719,697

Note: The table reports coefficient of the model in (1) using a Logit estimator. The underlying data is a matched employer-employee dataset for Sweden for the year 2007, covering all employees in the age interval 25-64 that live in city areas. The dependent variable is a dummy which is 1 if the individual leaves employment to become self-employed in 2008, either through a sole proprietorship or ownership of an incorporated business. The model include a full set of dummies for the educational specialization of individuals, dummies for occupation at the 1-digit ISCO-88 standard, dummies for the industry in which the individual works in 2007 at the 2-digit NACE industry level and dummies for each local labor market region. Robust standard errors are presented in parentheses. *** $p < .01$, **$p < .05$, * $p < .10$.

To facilitate interpretation as regards the estimated marginal effect of the fraction of entrepreneurs, Figure 4 plots the relationship between the predicted net conditional probability that an employee leaves her job for entrepreneurship and the fraction of established entrepreneurs in the residential neighborhood. The slope of the curve represents the combined marginal effect of the linear and quadratic fraction of neighborhood entrepreneurs, holding all other variables at their mean values. The

bars display the fraction of the individuals in the data that live in neighborhoods with a respective fraction of entrepreneurs.

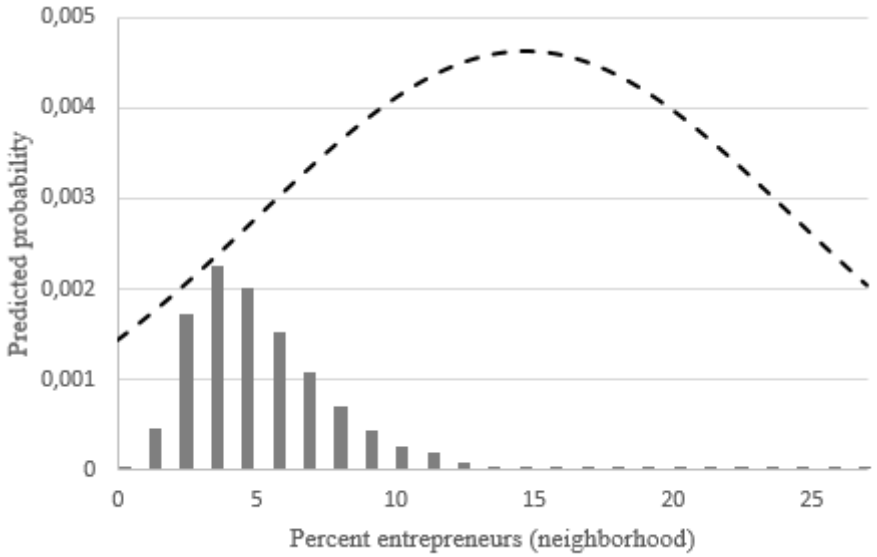

***Figure 4**. Predicted probabilities of becoming an entrepreneur, by neighborhood fraction of entrepreneurs. Dashed line shows predicted probabilities; grey bars show distribution of population.*

***Note:** All variables but the neighborhood fraction of entrepreneurs are held at their population mean values.*

As is evident from the bars displaying the distribution of population, the line is not entirely representative for the ranges along the distribution in which most people live. In fact, 99.7 percent of the total population live in neighborhoods with less than 15 percent entrepreneurs, meaning that utterly few persons actually are subject to the downward-sloping portion of the curve.

The estimated effect of the fraction of entrepreneurs in the neighborhood on individuals' decisions to switch to entrepreneurship is nevertheless small. The coefficient estimate in Table 4 implies a statistically significant average marginal effect of 0.11, when evaluated at the mean value of all variables. At the aggregate level, this small average effect on each individual in a neighborhood may still add up to a non-negligible effect on entrepreneurship across neighborhoods with initial differences in the fraction of entrepreneurs. A small effect that is repeated over extended periods of time may generate substantial heterogeneity in outcomes.

Consider for instance what the estimate implies for the comparison of two otherwise average neighborhoods, where the difference in entrepreneurial intensity is 5 percentage points of the working-age population. A literate interpretation of the estimates implies that the neighborhood with the higher fraction of entrepreneurs would produce about 6-7 additional entrepreneurs per square kilometer, each

year, taking account of the quadratic term and keeping all other variables at their mean values.[16] Further, the initial differences will be amplified over time through the feedback effect. The estimated influence of the fraction of entrepreneurs on start-up probabilities in fact implies localized increasing returns, driven by feedback effects in the form of a response-mechanism from the stock of entrepreneurs to future start-ups which amplify heterogeneity across neighborhoods. This also illustrates how social interactions may amplify initial differences in entrepreneurship between neighborhoods within cities.

The other neighborhood characteristics as well as the regional-wide factors have the expected effects. One particular finding is that the effect of neighborhood density, i.e. the sheer number working-age inhabitants in a neighborhood, is essentially zero. This result may appear counterintuitive, for example since denser neighborhoods would increase the frequency of contacts. On the other hand, sparser neighborhoods, all else equal, may be more conducive for the formation of social ties. There are also arguments in favor of that such ties are more important in smaller neighborhoods that may lack richness in supportive resources (Bauernschuster et al 2010, Westlund et al 2014).[17] A further result is that having highly educated individuals as residential neighbors also stimulate entrepreneurship. There are two ways to interpret this result. It could reflect that people with entrepreneurial skills, that often have longer schooling, sort themselves to neighborhoods with many educated residents. It could also reflect an influence of human capital externalities in entrepreneurship (cf. Acs and Armington 2004).

Tenure, wage income and employer size have a negative influence on the probability to becoming an entrepreneur. Individuals with longer schooling and whose establishment exit are also more likely to become entrepreneurs. These are standard results in the literature. The dummy for males and the age variable are also positive and significant, though the positive effect of age falls off as individual become older. The coefficients of the variables indicating that the individual is married, and that he or she has non-adult children staying in the same residence als have the predicted effects. Being an immigrant is not associated with the probability to leave employment for entrepreneurship.

4.4 Robustness and alternative interpretations

Some reasonable arguments may be raised against the results in Table 4 with regard to confounding factors. In this section we address some main causes for concern with respect to sorting of individuals, conceptual issues with collapsing sole proprietorships and incorporated businesses to one single indicator of entrepreneurship as well as sensitivity of the estimates with regard to additional control variables.

[16]The mean neighborhood has about 1250 inhabitants of working age (Table 3).
[17]Indeed, Bauernschuster et al (2010) find that social capital (measured as club membership) matters more for the decision to become entrepreneur for residents in smaller communities.

A general problem concerns non-random spatial sorting of entrepreneurs across neighborhoods within cities. It could be argued that individuals who decide to start a firm in a near future move to certain entrepreneurial neighborhoods before they actually start their firm. While this type of *ex ante* spatial sorting in response to entrepreneurial intentions is not directly observable in the data, such behavior should be manifested in the mobility patterns of entrepreneurs vis-à-vis ordinary employees. In particular, it should imply that residents of a neighborhood that leave employment for entrepreneurship are more likely to recently have moved into the neighborhood.

We do not find any support for such a phenomenon in the data. Figure 5 displays neighborhood tenure for those becoming entrepreneurs in 2008 and those who do not. The bars express the percentages of the total population in each sub-group that moved to a new neighborhood within the most recent 1-5 years. The descriptive data do not support the notion that entrepreneurs are more 'foot-loose' in their residential neighborhood decisions than ordinary employees. If anything, they appear to be somewhat less mobile than employees. This pattern is in fact broadly consistent with recent analyses of the 'home bias' of entrepreneurs. One explanation of this home bias is in fact that entrepreneurs exploit the richer endowments of local social capital in the home environments (Dahl and Sorenson 2012).

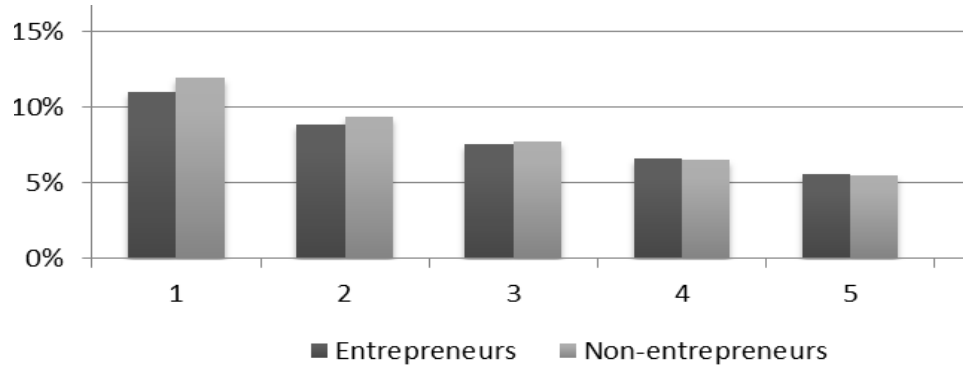

***Figure 5**. Neighborhood tenure (years) for entrepreneurs, and non-entrepreneurs, respectively.*

The rest of this section deals with issues of robustness in three main ways. First, we discriminate between limited corporations and sole proprietorships. Second, we add further controls to account for that the baseline estimates may be biased due to the occurrence of other factors that may reasonably affect startup behavior while being correlated with the share of entrepreneurs in a neighborhood. Third, we further assess the issue of sorting by looking at some key sub-groups in the population, and at various age intervals.

The reason for discriminating between different types of start-ups is the tendency for entrepreneurs to start limited liability firms if they expect their entrepreneurial venture to grow (Tåg et al., 2013).

Incorporated business start-ups should therefore more closely resemble what is referred to as 'high-impact' entrepreneurship in the Schumpeterian tradition (cf Gartner 1990, Henrekson and Sanandaji 2013). The baseline results could be driven by home-based and low-impact entrepreneurship. Our data yet discriminates between these types of firms, which allows us to estimate the effects of having entrepreneurial local peers on the start-up propensity with regard to each type of new firm. The estimates from the split-up regressions and their marginal effects are presented in Table 5. We conclude that there is a positive effect on startups for both firm types. While the results are consistent with local social interactions playing a role in both types of start-up decisions, the marginal effect is actually larger for startups of incorporated businesses.

Table 5. Estimated effects of neighborhood's fraction of entrepreneurs on the decision to enter entrepreneurship, by start-up type.

	(1)	(2)
Start-up type	Startup of incorporated business	Startup of sole proprietorship
Fraction entrepreneurs in the neighborhood	.1487*** (.0126)	.1500*** (.0181)
Average marginal effect	.07	.03

Note: The model is identical to (1) which is reported in Table 1. Robust standard errors are presented in parentheses. *** $p < .01$. Out of all startups, 61 percent are sole proprietorships, and 39 percent are incorporated businesses.

Further, we conduct sensitivity analyses with respect to various confounding factors, by adding additional control variables. The added controls are the neighborhood mean wage (step 1) and the neighborhood's fraction of entrepreneurs in 1991. Step 1 is intended to control for local demand at the neighborhood level, while also acting as a proxy for the general level of wealth in a neighborhood. Step 2 controls for another dimension of spatial sorting. If individuals move to certain 'entrepreneurial neighborhoods' in order to become entrepreneurs, then past measures of entrepreneurial frequencies at the neighborhood level should exhibit a downward effect on the coefficient of the present-day variable. The same argument holds true if 'foot-loose' entrepreneurs are attracted to natural amenities. Step 3 includes both added variables in one regression. Table 6 presents the coefficients of the main variable of interest from these regressions.

Table 6. Sensitivity analysis of the main specification in Table 4.

	(1)	(2)	(3)
Added control(s)	Neighborhood mean wage (ln)	Neighborhood fraction entrepreneurs 1991	(1)-(2)
Fraction entrepreneurs in the neighborhood	.1456*** (.0113)	.1560*** (.0103)	.1420*** (.0113)
Average marginal effect	.10	.11	.10

Note: Aside from the added control variables the model is identical to (1), the coefficients of which are presented in Table 4. Robust standard errors are presented in parentheses. *** $p < .01$.

The estimated marginal effect remains robust to the inclusion of both additional controls. We conclude that the results in Table 4 are robust to the inclusion of theoretically motivated additional variables, including neighborhood mean wage which also acts as a 'catch-all' variable, including capturing the effects of non-observable skills in the neighborhood. We hence argue that estimate (1) in Table 6 should be regarded as conservative.

In Tables 7-8 we deal more explicitly with the spatial sorting. In steps 1 and 2 of Table 7, we follow Lindbeck et al (2007) and test whether immigrants to Sweden are more likely to leave employment for entrepreneurship if they locate in a residential neighborhood with a high intensity of entrepreneurs. In our empirical context, the rationale for analyzing immigrants as a sub-group is two-fold. First, immigrants often have less local information and fewer local social ties, especially upon arrival. Recent immigrants, including those with certain entrepreneurial intentions or abilities, are therefore less likely to have sufficient knowledge of the Swedish economic geography and neighborhood characteristics within cities to be able to sort themselves to entrepreneurial neighborhoods. Second, in Sweden some streams of immigrants (e.g. refugees) are often assigned to specific neighborhoods by local authorities, giving this distinction some characteristics of a natural experiment.[18] This provide arguments why a focus on immigrants provides a test of the robustness the estimated influence of local entrepreneurial peers on start-up decision.

We further test whether the marginal effect of the neighborhood fraction of entrepreneurs on start-up propensities is higher for individuals who recently moved in to a neighborhood, i.e. whose neighborhood tenure is low. The idea behind this is as follows: if people with entrepreneurial intentions or abilities intentionally sort themselves to neighborhoods with high fractions of entrepreneurs, then the estimated marginal effect of the fraction of entrepreneurs should be higher for

[18]Our data, unfortunately, does not allow us to discriminate between different types of immigration. We also emphasize that our data only include individuals who held a job in 2007, and a quite low fraction of recent refugees are likely to be full-time employees. The fraction of the immigrants in our data that are assigned to certain neighborhoods by Swedish authorities is therefore expected to be low.

the in-migrants than for the neighborhood population at large. If the marginal effect is instead similar in size for recent in-migrants as for the general population of the neighborhood residents, then this weakens the argument that our baseline results may be driven by sorting. The results of this undertaking are presented in steps 3 and 4 of Table 7, where we perform separate estimations for individuals with a neighborhood tenure of 2 years or less and 5 years or less, respectively.

Steps 5 and 6 further test the issue of local demand driven entrepreneurship, by using a conservative (5) and a liberal (6) criterion for exclusion of industries that may have a very local market. We argued that one benefit of using neighborhood squares is that many traditional determinants of entrepreneurship operate at the city- rather than at the neighborhood level. One such traditional determinants is the market-size. However, the market for industries such as cafés, restaurants and hairdressers is typically local, which means that start-up decisions in such industries may be driven by the market-size of the neighborhood. To make sure that our estimated marginal effects of the fraction of entrepreneurs in the neighborhood simply not reflect that certain neighborhoods happen to have a good local market conditions for simple services with a local market, we run separate estimations when such industries are excluded.

Table 7. Estimated effects of neighborhood's fraction of entrepreneurs on the decision to enter entrepreneurship, by different sub-groups.

	(1)	(2)	(3)	(4)	(5)	(6)
Selection	Immigrants only	Immigrants arrived after 2002	Neighborhood tenure ≤ 5 years	Neighborhood tenure ≤ 2 years	Excluding local demand driven sectors	Excluding local demand driven sectors and retail
Neighborhood	.2109*** (.0307)	.1625** (.0813)	.1639*** (.0160)	.1771*** (.0235)	.1612*** (.0106)	.1571*** (.0111)
Average marginal effect	.15	.12	.12	.12	.10	.09
N	437,844	40,458	1,114,774	575,588	2,718,206	2,716,150

Note: The model is identical to (1), the coefficients of which are presented in Table 4. Robust standard errors are presented in parentheses. *** p < .01; ** p < .05. Local demand driven sectors are defined as NACE 93, including restaurants, and NACE 82, including hair dressers and beauty salons.

The results in Table 7 show that there is a statistically and economically significant impact of the fraction of entrepreneurs in the neighborhood even among the subset of immigrants (for newly arrived as well as the full population). The marginal effects are .15, and .12 respectively. Steps 3 and 4 also show that the marginal effect is actually rather invariant across individuals with different levels of neighborhood tenure. Steps 5 and 6 further test the previous proposition whether these patterns may be driven by local demand, and we conclude that the effect is remarkably robust.

As a final robustness test, we perform separate estimations for age groups. It can certainly be expected that individuals sort themselves across neighborhood based on their respective life cycle phases, and that this pattern is non-random with respect to start-up decisions. One could for example imagine that older people in the later stages of working-life sort themselves to certain neighborhoods and find the time for entrepreneurial behavior as their children have grown up. Moreover, older people are also more likely to be Estimates for three broad age intervals are presented in Table 8. Step 1 looks at younger individuals, and individuals in the early stages of parenthood. Step 2 looks at prime-aged individuals, while step 3 looks at individuals in the decade before the typical retirement age. Again, we find no significant differences in the influence of neighborhood intensity of entrepreneurs on start-up propensities. We conclude that the estimated influence of the fraction of established entrepreneurs in a neighborhood on the probability that a neighborhood resident leaves employment for entrepreneurship appears to be robust to alternative model specifications and sub-samples.

Table 8. Estimated effects of neighborhood's fraction of entrepreneurs on the decision to enter entrepreneurship, by age interval.

	(1)	(2)	(3)
Age interval	Age 25-35	Age 36-55	Age 56-64
Fraction entrepreneurs in the neighborhood	.1508*** (.0221)	.1533*** (.0141)	.1808*** (.0250)
Average marginal effect	.09	.10	.11
N	744,143	1,446,622	525,481

Note: The model is identical to (1), the coefficients of which are presented in Table 4. Robust standard errors are presented in parentheses. *** $p < .01$.

5. SUMMARY AND CONCLUSIONS

What explains persistent clusters of entrepreneurs across localities? This is an issue of importance, not least since several studies show that regional entrepreneurship has a significant influence on regional growth and development, i.e. the geography of entrepreneurship is often a driver of the geography of long-term growth and development.

In this paper, we tested local social interactions as a source of the phenomenon of clusters of entrepreneurs at the neighborhood level within regions. Our main conclusion is that social interaction effects are relevant in explaining the emergence and persistence of local clusters of entrepreneurs. We employed geo-coded matched employer-employee data and modeled individuals' decision to leave employment for full-time entrepreneurship as a function of the fraction of established entrepreneurs in their residential neighborhood. The analyses provide empirical evidence of a significant feedback effect in which existing entrepreneurs in a neighborhood breeds new local entrepreneurs. Our estimates imply that an otherwise average neighborhood with a 5 percentage point higher entrepreneurial intensity all else equal produce between 6 and 7 additional entrepreneurs per square kilometer, each year. It is clear that such an effect may over extended periods of time reinforce local rates of entrepreneurship and stimulate the development of a 'local entrepreneurship culture'. In fact, social interaction effects may be appreciated as a mechanism by which a local culture favoring entrepreneurship develops. The main channels for peer effects are indeed information and norms.

Our findings suggest an explanation for why a locality's history of entrepreneurship may matter even in the present day. Recent analyses have shown that regional disparities in entrepreneurship are highly persistent over time and also that the historical levels of entrepreneurship typically have a strong influence on current levels of start-ups (Fritsch and Wyrwich 2013, Fotopoulos 2013, Andersson and Koster 2011). The feedback effect implied by social interactions clarifies one mechanism by which an historical difference in entrepreneurship is maintained (or even reinforced) over time. Theoretical work on the emergence and evolution of entrepreneurship clusters, such as Minniti (2005), has emphasized this property of peer effects in entrepreneurship; i.e. that they imply path-dependence where small differences in initial conditions may have long-lasting consequences through feedback processes. Still, micro-level evidence of these effects, such as presented in this paper, where individuals' behaviors are modeled directly as a function of the behavior of others in their local environment has been limited.

It should of course be recognized that explanations of the role of entrepreneurship history involving social interaction effects are 'partial' (or proximate) in the sense that they can explain why initial conditions matter, but not what caused the initial conditions themselves. The causes of regional

differences in historical rate of entrepreneurship could be rooted in a random historical event or a particular historical natural asset favoring small-scale industries. Whatever reason for the initial condition, our results fits nicely with the argument that a locality's entrepreneurship culture has evolutionary origins and evolves over time as the local 'collective outcome' of individual decisions. As Minniti (2005, p.5) writes: "The social environment is not the planned outcome of the decisions of purposeful actors; rather it emerges as the unintended consequence of a sequence of decisions taken by individuals and serves as a conduit for information".

REFERENCES

Acs Z and C Armington (2004), "The Impact of Geographic Differences in Human Capital on Service Firm Formation Rates", *Journal of Urban Economics*, 56, 244-278

Akerlof, G (1997), "Social Distance and Social Decisions", *Econometrica*, 65(5), 1005-1028

Andersson, M (2012), "Start-Up Rates, Entrepreneurship Culture and the Business Cycle – Swedish patterns from national and regional data", in Braunerhjelm P. (Ed.) *Entrepreneurship, Norms and the Business Cycle – Swedish Economic Forum Report 2012*, Swedish Entrepreneurship Forum, Stockholm, pp. 91–110

Andersson, M and M Henrekson (2014), "Local Competitiveness Fostered through Local Institutions for Entrepreneurship", in Audretsch, D.B, A Link and M Walshok (eds), *Oxford Handbook of Local Competitiveness*, Oxford University Press, *forthcoming*

Andersson, M and P. Thulin (2013), "Does Spatial Employment Density Spur Inter-Firm Job Switching?", *Annals of Regional Science*, 51(1), 245-272

Andersson, M and S Koster (2011), "Sources of Persistence in Regional Start-Up Rates –evidence from Sweden", *Journal of Economic Geography*, 11, 179-201

Andersson, M, A. Baltzopoulos and H. Lööf (2012), "R&D Strategies and Entrepreneurial Spawning", *Research Policy*, 41, 54-68

Armington, C and Z Acs (2002), "The Determinants of Regional Variation in New Firm Formation", *Regional Studies*, 36, 33–45

Audretsch, D and M Keilbach (2005), "Entrepreneurship Capital and Regional Growth", *Annals of Regional Science*, 39(3), 457-469

Bauernschuster, S., O Falck and S Heblich (2010), "Social Capital Access and Entrepreneurship", *Journal of Economic Behavior & Organization*, 76(3), 821-833

Bertrand, M., E Luttmer and S Mullainathan (2000), "Network Effects and Welfare Cultures", *Quarterly Journal of Economics*, 115(3), 1019-1055

Beugelsdijk S (2007), "Entrepreneurial Culture, Regional Innovativeness and Economic Growth", *Journal of Evolutionary Economics,* 17, 187–210

Blanchflower, D and A Oswald (1998), "What makes and Entrepreneur?", *Journal of Labor Economics*, 16, 26-60

Boase, J., J.B Horrigan, B Wellman and L Rainie (2006), "The Strength of Internet Ties", *PEW Internet and American Life Project* (available at http://www.pewinternet.org)

Bosma, N., J Hessels, V Schutjens, M van Praag and Iverheul (2012), "Entrepreneurship and Role Models", *Journal of Economic Psychology*, 33, 410-424

Carrell, S., M Hoekstra and J West (2010), "Is Poor Fitness Contagious? – evidence from randomly assigned friends", *Journal of Public Economics*, 95, 657-663

Casson¸ M.C (1995), *Entrepreneurship and Business Culture*, Aldershot, UK and Brookfield, MA: Edward Elgar.

Chlosta, S., H Patzelt, S.B Klein and C. Dormann (2012), "Parental Role Models and the Decision to become Self-Employed - the moderating effect of personality", *Small Business Economics*, 38, 121-138

Clark, W. A. V. and F Dieleman (1996), *Households and Housing: Choice and Outcomes in the Housing Market*, New Brunswick NJ, Rutgers University

Dahl. M and O Sorenson (2012), "Home Sweet Home: Entrepreneurs' Location Choices and the Performance of Their Ventures", *Management Science*, 58(6), 1059-1071

Davidsson, P and B Honig (2003), "The Role of Social and Human Capital among Nascent Entrepreneurs", *Journal of Business Venturing*, 18(3), 301-331

Davidsson, P and J Wiklund (1997), "Values, Beliefs and Regional Variation in New Firm Formation Rates", *Journal of Economic Psychology*, 18, 179-199

Dunn, T and D Holtz-Eakin (2000), "Financial Capital, Human capital and the Transition to Self-Employment - evidence from intergenerational links", *Journal of Labor Economics*, 18, 282-305

Durlauf, S.N (2004), "Neighborhood Effects", in J. V. Henderson and J. F. Thisse (ed.), *Handbook of Regional and Urban Economics,* edition 1, volume 4, Elsevier, chapter 50, pp 2173-2242

Elfenbein, D.W, B.H Hamilton and T.R Zenger (2010), "The Small Firm Effect and the Entrepreneurial Spawning of Scientists and Engineers", *Management Science*, 56, 659-681

Etzioni A (1987), "Entrepreneurship, Adaptation and Legitimation", *Journal of Economic Behavior and Organization*, 8, 175–199

Falck, O., S Heblich and E Luedemann (2012), "Identity and Entrepreneurship: do school peers shape entrepreneurial intentions?", *Small Business Economics*, 39, 39-59

Farber, H.S. (1994), "The Analysis of Inter-Firm Worker Mobility", *Journal of Labor Economics*, 12, 554–593

Feijten, P. and C Mulder (2005), "Life course experience and housing quality", *Housing Studies*, 20, 571–588

Fletcher, J (2011), "Social Interactions and Smoking - evidence using multiple student cohorts, instrumental variables and school fixed effects", *Health Economics*, 19, 466-284

Fornahl D (2003), "Entrepreneurial Activities in a Regional Context", in Fornahl D and T Brenner (Eds), *Cooperation, Networks and Institutions in Regional Innovation Systems,* Edward Elgar, Cheltenham, pp. 38–57

Fotopoulos, G (2013), "On the Spatial Stickiness of UK New Firm Formation Rates", *Journal of Economic Geography*, (doi: 10.1093/jeg/lbt011)

Fritsch, M and M Wyrwich (2013), "The Long Persistence of Regional Levels of Entrepreneurship – Germany, 1925-2005", *Regional Studies* (http://dx.doi.org/10.1080/00343404.2013.816414)

Gartner, W.B (1990), "What Are We Talking about When We Talk about Entrepreneurship?", *Journal of Business Venturing*, 5(1), 15–28

Gaspar, J and E Glaeser (1998), "Information Technology and the Future of Cities", *Journal of Urban Economics*, 43(1), 136-156

Gennaioli, N., R La Porta, F Lopez-de-Silanes and A Shleifer (2013), "Human Capital and Regional Development", *Quarterly Journal of Economics*, 128(1), 105-164

Giannetti, M and A Simonov (2004), "On the Determinants of Entrepreneurial Activity – social norms, economic environment and individual characteristics", *Swedish Economic Policy Review*, 11, 269-313

Giannetti, M and A Simonov (2009), "Social Interactions and Entrepreneurial Activity", *Journal of Economics & Management Strategy*, 18(3), 665-709

Glaeser, E (2000), "The Future of Urban Research – nonmarket interactions", in W.G. Gale and J.R. Pack (eds), *Brookings–Wharton Papers on Urban Affairs 2000*, The Brookings Institution, Washington, DC, 2000

Glaeser, E (2007), "Entrepreneurship and the City", NBER Working Paper 13551

Glaeser, E and B Sacerdote (2000), "The Social Consequences of Housing", *Journal of Housing Economics*, 9(1-2), 1-23

Glaeser, E and J Scheinkman (2003), "Non-Market Interactions", in M Dewatripont et al (eds) (2003), *Advances in Economics and Econometrics – theory and applications*, Cambridge University Press, Cambridge, pp 339-370

Glaeser, E., B Sacerdote and J Scheinkman (1996), "Crime and Social Interactions", *Quarterly Journal of Economics*, 111, 507-548

Glaeser, E., B Sacerdote and J Scheinkman (2003), "The Social Multiplier", *Journal of the European Economic Association*, 1, 345-353

Granovetter, M.S. (1995), *Getting a Job: a study of contacts and careers*, 2nd ed. University of Chicago Press, Chicago

Guiso, L and F Schivardi (2011), "What Determines Entrepreneurial Clusters?" *Journal of the European Economic Association* 9(1), 61–86.

Henrekson, M and T. Sanandaji (2013), "Billionaire Entrepreneurs: A Systematic Analysis", Working Paper Series 959, Research Institute of Industrial Economics

Hundley, G. (2000), "Male/Female Earnings Differences in Self-Employment: the effects of marriage, children, and the household division of labor. *Industrial and Labor Relations Review*, 54, 95-114

Hyytinen, A and M Maliranta (2008), "When Do Employees Leave their Job for Entrepreneurship?" *Scandinavian Journal of Economics* 110 (1), 1-21

Jargowsky, P.A (1996), "Take the Money and Run – economic segregation in the US metropolitan areas", *American Sociological Review*, 61, 984-998

Johnson, J.D and R Rasker, (1995), "The Role of Economic and Quality of Life Values in Rural Business Location", *Journal of Rural Studies*, 11, 405–416

Kim, PH and H Aldrich (2005), "Social Capital and Entrepreneurship", *Foundations and Trends in Entrepreneurship*, 1(2), 55-104

Klyver, K., K. Hindle and T Schøtt (2007), "Who will be an Entrepreneur? - how cultural mechanisms and social network structure together influence entrepreneurial participation", *Frontiers of Entrepreneurship Research* 27(7), 305-320.

Licht, A.N and J Siegel (2006), "The Social Dimension of Entrepreneurship", in M Casson and B Yeung (eds), *Oxford Handbook of Entrepreneurship*, Oxford University Press, Oxford

Lindbeck, A., M Palme and M Persson (2007), "Social Interaction and Sickness Absence", IFN working paper No. 725 2007

Manski, C (1993), "Identification of Endogenous Social Effects: The Reflection Problem", *Review of Economic Studies*, 60(3), 531-542

Manski,C (2000), "Economic Analysis of Social Interactions", *Journal of Economic Perspectives*, 14(3), 115-136.

Mason, C.M, S Carter and S Tagg (2011), "Invisible Businesses: the characteristics of home-based businesses in the United Kingdom", *Regional Studies*, *45*(5), 625-639.

Minniti, M (2005), "Entrepreneurship and Network Externalities", *Journal of Economic Behavior and Organization*, 57, 1-27

Mulder, C. and M. Wagner, M (1998), "First-time home ownership in the family life course: a West German-Dutch Comparison", *Urban Studies*, 35, 687–713

Nanda, R and J.B Sorensen (2010), "Workplace Peers and Entrepreneurship", *Management Science*, 56, 1116–1126

Pflueger, M and J Suedekum (2008), "A Synthesis of Footloose-Entrepreneur New economic Geography Models - when is agglomeration smooth and easily reversible?", *Journal of Economic Geography*, 8, 39-54

Rees, H. and A Shaw (1986), "An Empirical Analysis of Self-Employment in UK", *Journal of Applied Econometrics*, 1, 95–10

Saxenian, A (1994), *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Harvard University Press, Cambridge MA

Scheinkman, J (2008), "Social Interactions (theory)", *The New Palgrave Dictionary of Economics*, 2nd Edition

Sorenson, O and PG. Audia (2000), "The Social Structure of Entrepreneurial Activity: Geographic Concentration of Footwear Production in the United States, 1940–1989." A*merican Journal of Sociology* 106(2), 424–462.

Tåg, J., T Åstebro and P Thompson (2013), "Hierarchies, the Small Firm Effect, and Entrepreneurship: Evidence from Swedish Microdata", Working Paper Series 954, Research Institute of Industrial Economics

Topa, G (2001), "Social Interactions, Local Spillovers and Unemployment", *Review of Economic Studies*, 68, 261-295

Wellman, B (1996), "Are Personal Communities Local? A Dumptarian Reconsideration", *Social Networks*, 18, 347–354

Wellman, B., A.Q Haase, J Witte and K Hampton (2001), "Does the Internet Increase, Decrease or Supplement Social Capital? – social networks, participation and community commitment", *American Behavioral Scientist*, 45(3), 436-455

Wenting, R., O Atzema and K Frenken (2011), "Urban Amenities or Agglomeration Economies? - the locational behavior and economic success of Dutch fashion design entrepreneurs", *Urban Studies*, 48, 1333-1352

Westlund, H and R Bolton (2003), "Local Social Capital and Entrepreneurship", *Small Business Economics*, 21, 77-113

Westlund, H., J P Larsson and A. Rader Olsson (2014), "Startups and Local Social Capital in the Municipalities of Sweden", *Regional Studies, forthcoming*.

Williamson O (2000), "The New Institutional Economics – taking stock and looking ahead", *Journal of Economic Literature*, XXXVIII, 595-61

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