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Local Networks and New Business Formation

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Abstract

New business formation is a key driver of regional transformation and development. While we know that a region's attractiveness for new businesses depends on its resources, infrastructure, and human capital, we know little about the role of local business networks in promoting or impeding the birth of new firms. We construct local business networks connecting more than 350 million nodes consisting of managers, owners and firms using administrative data on all German businesses from 2002 to 2020. Differentiating between serial and de-novo entrepreneurs, we show a positive but decreasing relation between a region's connectedness and firm entry of serial entrepreneurs. Networks are, moreover, positively linked to firm survival. Relating our findings to a measure of ownership concentration, we show that networks provide additional explanations for regional variation in new business formations. These patterns are robust to synthetic instrumental variable estimations.

Keywords: New Firm Formation, Business Networks, Serial Entrepreneurship, Regional Dynamics, Ownership Concentration

JEL Classification: L14, L26, M13, O31

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1 Introduction

The formation of new businesses is an essential driver of innovation, regional competitiveness, and growth (Acs & Audretsch, 1988; Audretsch & Peña-Legazkue, 2012; Haltiwanger, Jarmin, & Miranda, 2013; Haltiwanger, 2022). New businesses contribute to introducing innovative products and processes, to the diffusion of novel technologies (Audretsch, Link, Sauer, & Siegel, 2016), and the creation of jobs (Haltiwanger et al., 2013). Moreover, radical innovations are more likely to be implemented by entrants rather than established firms as the latter are often path-dependent in existing technologies (Acs & Audretsch, 1988; Yin & Zuscovitch, 1998; Schneider & Veugelers, 2010; Chapman & Hottenrott, 2022). Besides this direct impact on innovation, new firms' activities exercise pressure to innovate on incumbents and thereby increase these firms' incentives to invest in Research and Development (R&D) (Henderson, 1993; Schneider & Veugelers, 2010). However, the entrepreneur does not fully appropriate the returns to the creation of a new firm. Social gains may even exceed private returns through the value generated by better products, higher-quality services, or improved processes from which consumers and employees benefit.

Declining business dynamism in recent decades, particularly the lack of entry of new high-growth firms, raises concerns about the incentives for entrepreneurial activities (Decker, Haltiwanger, Jarmin, & Miranda, 2016; Haltiwanger, 2022; Decker, Haltiwanger, Jarmin, & Miranda, 2020). Earlier research discusses several causes of this phenomenon. The decline in the share of U.S. households participating in entrepreneurial activities and the increase in the average skill level of founders suggests a stronger selection into entrepreneurship (Salgado, 2020). Considering that individuals accumulate knowledge and skills over time, this finding aligns with the fact that successful entrepreneurs are getting older (Azoulay, Jones, Kim, & Miranda, 2020). Further trends such as increasing market concentration, slower productivity growth, and reduced investment rates may also be interrelated with a decline in new business formation (Syverson, 2019; Haltiwanger, 2022).

The decline in business dynamism is an international phenomenon. Several European countries report declining or stagnating start-up rates as well as highly skewed distributions in new firms' growth rates (EFI, 2017; OECD, 2017). Importantly, there is substantial regional variation in the quantity and quality of new businesses (Guzman & Stern, 2020;

OECD, 2017) stressing the importance of understanding the regional impediments and facilitators of new business formation. In general, we know that regional factors such as wages (Audretsch & Vivarelli, 1996), physical infrastructure (Audretsch, Heger, & Veith, 2015), and the availability of human capital (Glaeser & Kerr, 2009) are important determinants of new business formation. In addition, previous research highlights the importance of the local ecosystem ("Social capital of entrepreneurs and small firm performance: A meta-analysis of contextual and methodological moderators", 2014; Guzman & Stern, 2020) and social networks (Sorenson, 2003; Sorenson, Rivkin, & Fleming, 2010; Leyden, Link, & Siegel, 2014) through their role in the diffusion of knowledge or the access to resources. Access to the local community may positively support the formation of new businesses, thereby increasing attractiveness for entrepreneurial activities in better-connected regions. Meanwhile, there is an ongoing discussion on the increase in common ownership, the rise in market concentration, and its effects on competitive behavior. These developments may constitute an impediment or an enabler to new businesses. Connections between owners of firms may result in weaker competition (Azar, Schmalz, & Tecu, 2018; Antón, Ederer, Giné, & Schmalz, 2022; Bayona, López, & Manganelli, 2022) and therefore de-incentivize newcomers. Empirical evidence indeed suggests that industries with more common ownership have fewer investments (Gutiérrez & Philippon, 2016) and lower levels of innovation (Li, Liu, & Taylor, 2023). However, better connectedness may make further activities particularly attractive for network members. The reduced competition can increase marginal benefits of R&D investments thereby positively affecting innovation (Gibbon & Schain, 2022; López & Vives, 2019; Antón, Ederer, Giné, & Schmalz, 2021; Levy, 2023).

As the interconnection of firms through common owners impacts the behaviour of companies (Gibbon & Schain, 2022), it is important to evaluate its relevance for firm entry. The direct link between coteries, reflected by ties between relevant actors, and new business formation, however, is less well understood. While regional research considered local conditions as drivers of new firm formation, new businesses emerge typically in locations where founders live and work (Sorenson & Audia, 2000). Therefore, local network ties likely matter. Social ties are relevant for entrepreneurial success in terms of survival and growth (Brüderl & Preisendörfer, 1998; Kreiser, Patel, & Fiet, 2013; Song, Dana, & Berger, 2021). They also influence the decision to become an entrepreneur. For example, academics are more likely to

start a business if their direct social ties, i.e., their colleagues, are also entrepreneurs (Stuart & Ding, 2006). Moreover, the innovativeness of high-tech startups is greater when founders have strong ties to researchers at universities and research organizations (Fudickar & Hottenrott, 2019). Thus, social ties seem extremely relevant for entrepreneurial growth, innovation, and success. The crucial question is whether these benefits also exist in local business networks, which comprise ownership and management networks. Networks are then a source of social capital, i.e. as an 'accumulative resource' (Bourdieu, 1980) with the potential to be monetarized. However, tight networks may act as gatekeepers that discourage newcomers from entering the location as social capital is only accessible for those within the cloub.

To address this research question, we construct local business networks using information on the universe of legally registered businesses and their relevant stakeholders in Germany between 2002 and 2020. This allows us to calculate the interconnection between businesses and individuals and businesses within Germany's 257 labor market regions. More precisely, we construct a region's average degree as a key network measure based on all links between actors related to about 3 million companies. Adopting such a regional perspective of a founder's entry decision, we investigate how the regional interconnection of firms measured by local business networks relates to forming new businesses. To address potentially different interests of owners and managers, we further distinguish between the connectedness of firms, owners, and managers.

Since the strength of ties or the degree of connectedness of a network could also reflect the information flows between actors within the network (Kuhnen, 2009; Granovetter, 1973) or the cost associated with networking (Inci & Parker, 2013), we differentiate between truly new actors and those who are already part of the business network. Hence, actors within the network such as serial entrepreneurs[1], benefit while individuals from outside, i.e., de-novo entrepreneurs, may find it challenging to build linkages with an existing, highly connected business network. If this was the case, de-novo entrepreneurs might abstain from establishing a business while serial entrepreneurs benefit from stronger network ties as they are already part of the network.[2]

[1]Serial entrepreneurs are sometimes also referred to as re-starters (Metzger, 2006; Gottschalk & Müller, 2022; Gottschalk, Greene, & Müller, 2017; Chen, 2013).

[2]Examples can also be found in the venture capital literature presenting evidence that entrepreneurs that have been funded by venture capital (and are therefore part of a network) find it easier to attract investors when starting a new business (Zhang, 2011; Gompers, Kovner, Lerner, & Scharfstein, 2006).

We expect that local networks matter for founders, but the direction of the effect depends on their access to the network. While more connected networks may *increase* knowledge flows among actors *inside* the network and lead to the discovery of new entrepreneurial opportunities, they may also *decrease* entrepreneurial incentives of actors *outside* the network. This implies that in locations with more connected networks, we see more new businesses created by serial entrepreneurs but not by de-novo founders.

In the following study, we document a steady increase in the connectedness of local business networks (LBN) over time as measured by the average degree. In terms of new business creations over time, we see stagnating numbers for serial entrepreneurs and a decline in business formation by de-novo entrepreneurs. Hence, entrepreneurial activity is increasingly driven by serial entrepreneurs. This pattern appears for local ownership networks (LON) and management networks (LMN). The increase in the average degree is most pronounced for LMN. We show in regression analyses (that account for multiple other factors) that the more connected an LBN is, the more serial entrepreneurship there is. Yet the more intensely connected the region, the smaller the positive effects which eventually diminish at very high degrees of connectedness. This relation is robust to various specification tests and synthetic instrumental variable estimation. For de-novo entrepreneurs, however, the local network structure does not seem to determine their entry decision. We further extend the analysis by considering regional characteristics as moderators of these results. We group labor market regions into two types: urban versus rural/peripheral regions. Yet our results reveal similar patterns within and outside of urban areas.

We further relate our findings to research on common ownership by constructing a Herfindahl-Hirschman Index for local ultimate owner concentration (LUOC). This measure is correlated to the networks such that the correlation is negative for less concentrated regions but positive for most concentrated locations. When including both measures to explain new business formation, we find the conclusions for local networks are unaffected. Common ownership itself is negatively related to new business formations. This result is, however, not robust to all estimation methods. Finally, we explore the nature of the new businesses. In regions with more connected LBN, we find a higher number of firms with more employees at the start founded by serial entrepreneurs. Moreover, the number of firms surviving the first critical years increases with their location's connectedness for both, serial and de-novo founders.

These findings have implications for understanding differences in entrepreneurial activities across regions and how local networks affect entrepreneurial incentives. Although local connections between businesses via ownership or managerial relations do not seem to hurt entry by de-novo entrepreneurs, the much smaller group of serial entrepreneurs appropriates the positive effects. Overall, our findings suggest that sluggish startup rates are not necessarily caused by local networks, yet they do not seem to foster entry by new entrepreneurs.

2 Data and Measurement of Local Business Networks

2.1 Data

The primary data used for the analysis is the Mannheim Enterprise Panel (MUP). This panel builds on the official German Business Registry, which records all newly founded firms, information on stakeholders, and the firms' characteristics. This data is augmented with additional information collected by Creditreform, Germany's largest credit rating agency. Creditreform researches even small firms that are not obligated to disclose information to the registry. Moreover, it constructs a credit rating index by acquiring additional information from owners and managers and from other firms that maintain business relations with the focal firm. The resulting data set contains the universe of all economically active firms in Germany and is maintained since 1990 with full information since 2002.

We conduct further steps of preparation on the MUP data: removal of duplicates, errors, time inconsistencies, founder identification, and stakeholder disambiguation based on names and addresses. In this process, we remove entities active in some sectors according to their NACE classification since their information is not fully reliable in the MUP. This concerns agriculture (NACE A), private households (NACE T), and offshore organizations and bodies (NACE U).[3]

In total, we use the information for 307,723,655 actors. These include all types of actors in their different roles they take in these businesses. The actors can be natural or legal entities (i.e., individuals or firms) distributed across all of Germany. Based on their address

[3] A: Agriculture, forestry and fishing; T: Activities of households as employers; undifferentiated goods - and services-producing activities of households for own use, U: Activities of extraterritorial organizations and bodies.

information, we can assign them to the 257 labor market regions within Germany and keep them in our data if they were active for at least one full year over the 2002-2020 period. We then aggregate the individual information extracted from the MUP to the labor market region level, resulting in a panel data set for the 257 regions and the years 2002 to 2020.[4] Labor market regions represent an economically related area (district-level) that takes both administrative factors and commuting patterns into account (*BBSR-Bundesinstitut für Bau-, Stadt und Raumforschung*, 2023). Labor market regions typically contain multiple districts except for larger metropolitan areas such as Berlin, Munich, Cologne, and Hamburg. Instead of random district borders, labor market regions capture economically and socially connected regions. The notion of belonging to the same economic environment is important for evaluating the relevance of local business networks (LBN) since connections are unlikely to end at random borders. Finally, labor market regions can be unambiguously assigned to different regional categories, i.e., urban areas versus rural and peripheral ones.

2.2 Measurement of Local Networks

The idea behind LBNs is to capture linkages between relevant agents in a region and their connectedness. In social network analysis, such structures are typically measured by the degree of a network (Jackson, 2008; Kuhnen, 2009). The average degree of a region measures the average connectedness (degree centrality) of an average actor in this region.

Calculating the average degree of an LBN requires determining the relevant actors within the network. These actors can be firms within the region or individuals connected to these firms due to a formal claim such as ownership or a management role. We locate firms and individuals based on their address and identify involved individuals based on their role as owners, managing directors, general managers, partners, members of the board of directors, or majority shareholders in a given year.

This yields for each year and region all relevant actors that could be connected as well as the actual links between them. These links can be firm-to-firm or firm-to-person connections, capturing ownership as well as management. While we do not record person-to-person links directly, we measure them indirectly since two individuals can be connected to the same firm

[4]This data set is available for replication and research purposes at the Research Data Centre of the ZEW Leibniz Centre for European Economic Research (*MUP Regio*, 2023).

in a given year. For example, two managers who run a company together. In principle, we can, of course, separate the links by tasks and roles and thereby distinguish between local ownership networks (LONs) and manager networks (LMNs).

To illustrate the calculation of the average degree of the local network, we use an example network in the following. The active actors represent the nodes of the network v_{kt}, which has a total size of N (number of nodes within a network) in region k in year t. Since actors cannot be linked to themselves, each node has N-1 possible connections (edges). Two nodes i and j of a network (within a region and a year) can share an edge $e_{v_i v_j}$ where the edge takes the value of one if the actors are connected and take the value of zero otherwise. For example, an edge can take the value of one if the node (actor) i is a managing director or owner of node (actor) j, which is a firm. By summing up all edges of a node, we calculate the degree centrality of a node $d(v_i) = \sum_{j=1}^{N} e_{v_i v_j}$ where $j = i + c \; \forall \, c = 1 \ldots (N-1)$. Figure 1 illustrates a simple network containing five actors (nodes $N = 5$ nodes v_1, v_2, v_3, v_4 and v_5).

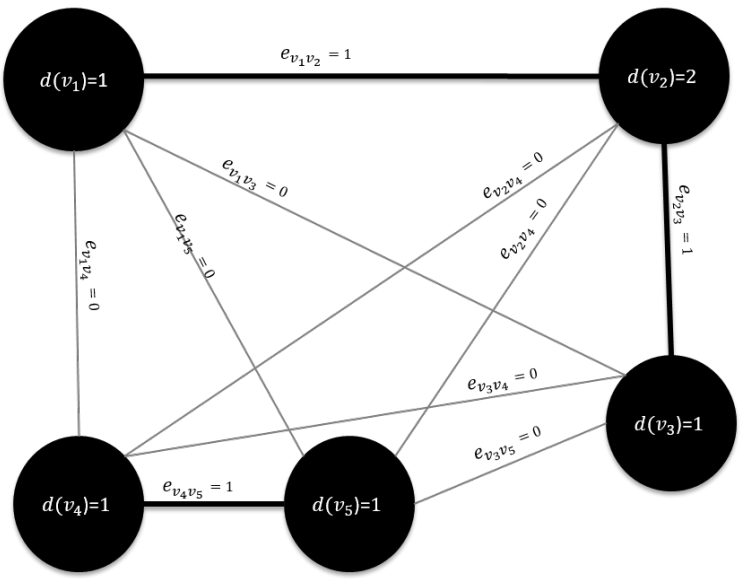

Figure 1: Degree Centrality in a Simple Network

Let us assume nodes one and two, as well as nodes two and three and four and five, share a connection $e_{v_i v_j} = 1$ (thick black) while the other edges (thin grey) are only possible but not realized connections $e_{v_i v_j} = 0$. Calculating the degree centrality of each actor within this network $d(v_i)$, gives a degree equal to one for actors one, three, four, and five and a degree centrality of two for actor two[5].

[5] $dv_1 = 1, dv_2 = 2, dv_3 = 1, dv_4 = 1$ and $dv_5 = 1$

Based on the individual degree centrality, we can now derive the average connectedness of actors within a region. Averaging over all the actors' values within a region and a given year, we obtain the *AverageDegree*. Formally the average degree of labor market region k and year t can be denoted as

$$AverageDegree_{tk} = \frac{1}{N} \sum_{i=1}^{N} d(v_i). \tag{1}$$

Going back to the simple network, the average degree is 1.2.[6] In our application, the average degree has a natural minimum value of one because each actor has at least one connection, i.e., each firm has at least one owner and each individual at least one role. If the network consisted of only such actors, we would have an average degree of one. At the other extreme, each actor could potentially be connected to all other actors. The maximum number of connections an actor can have is N-1. If all actors within the network were connected to N-1 actors 1/N*(N)*(N-1), we would see an average degree of N-1.

The advantage of the average degree as a measure of connectedness is that it accounts for the overall number of actors in a region and hence, the number of potential connections without being to sensitive to the networks size. This is important to avoid that connectedness mechanical changes with network size. For instance, network density would be very sensitive to the number of potential actors if realized connections do not grow proportionally with the number of actors in a local network.

Of course, the average degree is sensitive to the entry or exit of one well-connected actor. However, when looking at the minimum and maximum number of actors per year and region in our data (LBN: min. = 13,288 and max. = 996,921; LON: min. = 12,465 and max, = 919,934; LMN: min. = 12504 and max. = 958,914), the likelihood that new or exiting actors are connected to a number close to the maximum is unlikely and the distribution of the average degree seems plausible (Figure A.1)[7]. It shows that the values are closer to the minimum value of one, but also not one, on average. Generally, the average degree for urban

[6] (1+2+1+1+1)/5=1.2

[7] Indeed the maximum degree an actor has within a year and labor market region ranges from 31 to 1,395 for LBN, and 28 to 1,345 for LON and LMN

areas is slightly higher than for rural/peripheral regions. A t-test of differences in means shows that this difference is positive and statistically significant (P-Value of 0.00%) for all three measurements of connectedness[8]. Overall, the distributions of the average degree of the different network types (LONs and LMNs) are quite similar.

Investigating the development of the network structures over time, we find that the average degree is slightly increasing (Figure 2). Moreover, the average degree is persistently higher in urban areas, and the increase is stronger in management networks (LMNs) than in ownership networks (LONs).

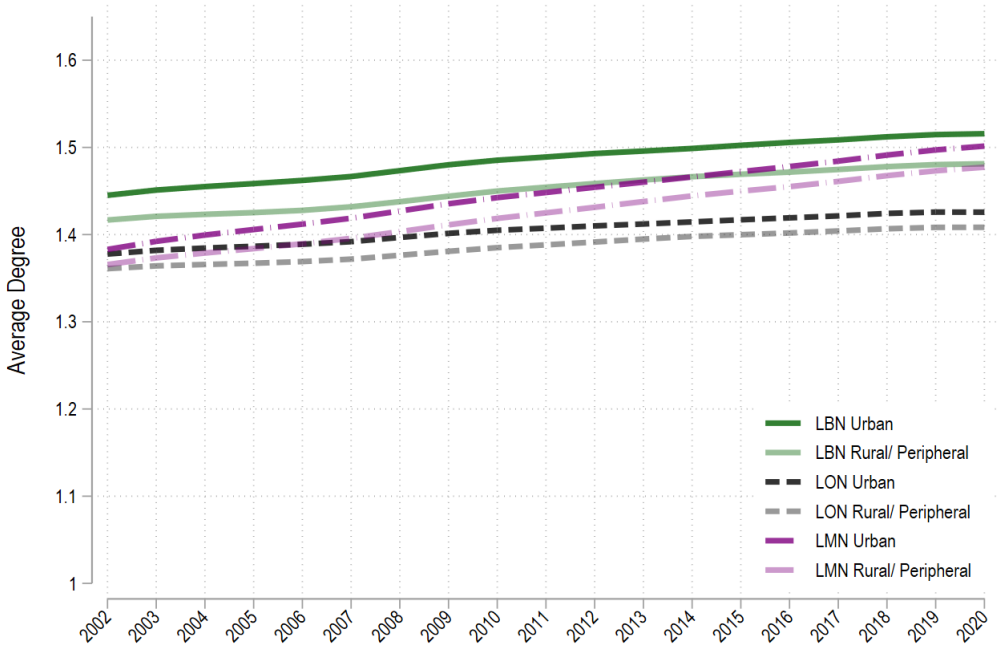

Figure 2: Development of the Average Degree over Time

2.3 Measurement of Business Formation

We start with identifying founders and their entrepreneurial experience. Based on this information, we can distinguish new businesses founded by de-novo entrepreneurs (without prior founding experience) versus serial entrepreneurs (with founding experience).[9] To capture the distinction between de-novo and serial entrepreneurs, we first need to identify founders

[8] Mean difference Urban-Rural: LBN: 0.034, LON: 0.018, LMN: 0.022

[9] While closely related to the 'de-novo firm' concept (Geurts & Van Biesebroeck, 2016), our level of analysis at this stage is individuals rather than companies. De-novo implies here that an individual has not been recorded as a founder in any previous business activity going back to the beginning of our data, i.e., the year 1990.

uniquely. To identify founders, we use the shareholder data from the MUP, including starting and end dates of involvement, roles, and positions. Since founders of firms are not marked as such in the shareholder data, we implement three sorting steps, resulting in two definitions of a founder. First, we require a founder to hold at least an important position within a firm, meaning she is either owner, managing director, general partner, a member of the board of directors, or a majority shareholder. Moreover, we require founders to have joined the firm within the first two months of its official founding date. This way of identifying founders makes sure that we capture all relevant actors from the beginning. A second, stricter definition requires the founding team to hold the majority of shares and each founder to have a managing position within the firm. See Appendix A for details regarding these two definitions. We consider someone an experienced founder (serial entrepreneur) if the person has been involved in a previously founded firm from the beginning, according to these definitions. Such founder experience may determine how much local network structures actually matter for the decision to start another company.[10] We expand the history for this detection exercise to the year 1990.[11] Obviously, a person can evolve from a de-novo to a serial entrepreneur with consecutive involvement in a second firm, whereby we use the exact date of business registration to determine the first and subsequent founding activities. We identify 4,107,570 founders from 1990 to 2020 (and 3,222,670 since 2002), of which 573,173 (14%) can be classified as serial entrepreneurs since 1990 (520,404 since 2002 corresponding to 16%).[12]

Based on identifying different founders, we can now classify unique new businesses founded by de-novo versus serial entrepreneurs. Importantly, a new firm is only considered de-novo if none of the founders has entrepreneurial experience. We count the annual number of new firms by type at the regional level. Among the 2,876,615 firms founded in the period from 2002 to 2020, we find 812,512 firms (28%) founded by serial and 1,612,174 by de-novo entrepreneurs (56%) according to the first definition.[13]

[10] We can also trace founders' movements across sectors when they repeatedly start new businesses. The report these transitions in Table A.1 where we find a high persistency of founders staying in the 'home sector', but some transitions across sectors. Most founders in our data remain, however in related sectors such as from manufacturing to repair of vehicles or technical services.

[11] Note that due to the data source, entrepreneurial experience outside of Germany cannot be considered, but we count all previous experience independent of the location within Germany.

[12] According to the second definition, we identify 1,729,194 entrepreneurs of which 1,259,832 were found after 2002. According to this definition, the overall number of serial entrepreneurs is 83,261, of whom 77,871 founded a company after 2002.

[13] For the second definition, we identify 1,417,369 de-novo and 76,962 serial entrepreneurship new business formation firms.

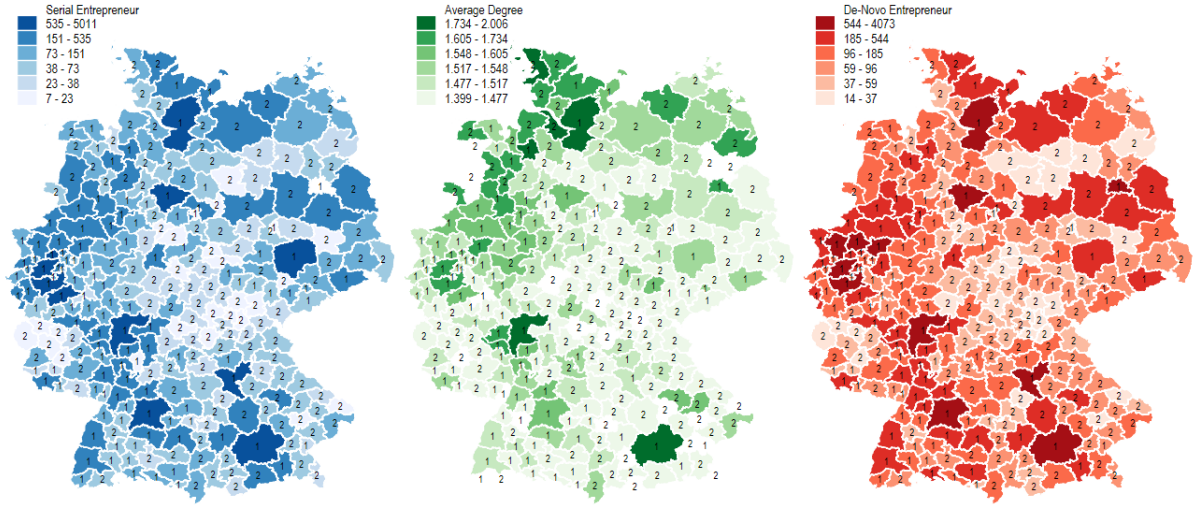

Figure 3: Serial and de-novo entrepreneurship new business formation and average degree for labor market regions in 2020 (1: urban; 2: rural/peripheral)

These firms can take any legal form, with limited liability companies and private commercial enterprises constituting the largest groups. Using the second definition, we see a lot more commercial enterprises because individuals are more often managers and owners at the same time. Table A.7 in the Appendix presents the distribution of both firms across legal forms differentiated by the first and second definitions of founders. For this reason, we focus on the first definition in the following. Figure 3 presents the number of new business formations by serial (left) and de-novo entrepreneurs (right) as well as the average degree (middle) graphically for the year 2020. The maps show the role of metropolitan areas with higher new business formation activity, and illustrate the regional variation. The average degree, however, shows different patterns with both highly connected urban and peripheral regions. Interestingly, north-western regions are more interconnected than the central and southern regions. While the maps show the numbers only for the most recent year, we can see that the development over time is also quite striking. Figure 4 shows that business formations by serial entrepreneurs (left) increased strongly from 2002 to 2010 but stagnated in subsequent years.

This pattern is more pronounced in urban areas where much of the activity takes place. The development is different for de-novo entrepreneurs, with a peak in the late 2000s and declining numbers since then. The decline is also quite strong in urban areas. These patterns and developments raise the question of whether there is a link between local networks and new business formations. This link, however, could differ for de-novo versus serial entrepreneurs and depend on the region's nature.

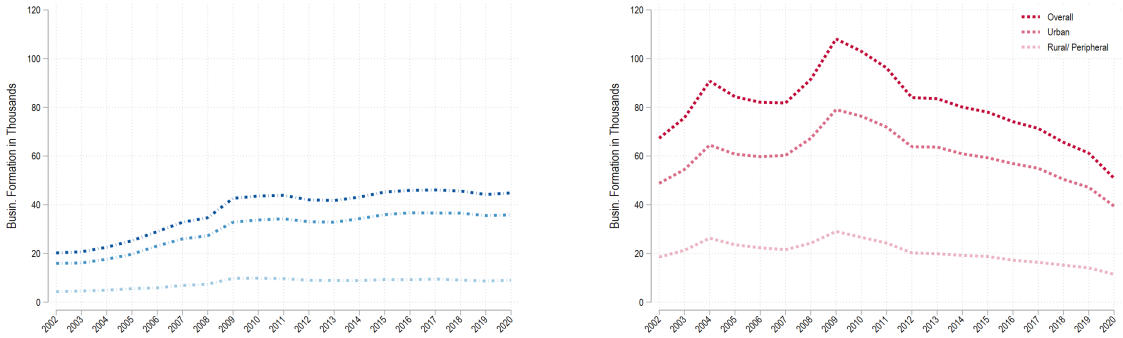

Figure 4: Business Formation (SE -left and DN-right) over time

3 Estimation Strategy

To investigate the relationship between the interconnection of local networks and new firm formation, we build one main framework, which we extend later in several ways. The basic model can be expressed as:

$$\begin{aligned} \#BusinessFormation_{t,k} = \beta_0 + \beta_1 AverageDegree_{t-1,k} \\ +\beta_2 AverageDegree^2_{t-1,k} + X_{tk}\gamma + \lambda_t + c_k + \epsilon \end{aligned} \tag{2}$$

where $\#BusinessFormation$ in region k at year t is the count of new businesses, which can be either by de-novo or by serial entrepreneurs. $AverageDegree$ is the measure of the respective local network (LBN, LON, or LMN) $AverageDegree^2$ is the squared term capturing potential non-linearities in the relationship between connectedness and new business formation.

X is a vector of time-varying control variables containing information on regional characteristics that likely also impact business formation, such as proxies for potential founders measured by the unemployed individuals in a region (Gottschalk, Muller, & Niefert, 2010), labor force participants (all inhabitants who are between 15 and 64 years old) and net-migration

(Audretsch & Keilbach, 2004). We also include local purchasing power by including GDP. We further account for past business dynamism in the region by counting the number of existing, active firms in a given year and sector. This also controls for potential competitors, and changes in the stock can reveal the direction of the structural development of a region (boom versus decline). We employ a one-period lag of this stock in our analysis.

Finally, we include characteristics of local firms (averaged in the region) to capture the general business environment: foreign ownership share, credit ratings, revenues as a proxy for firm size, and average firm age.[14] We cluster standard errors on the level of the labor market region in all of the following analyses. While these regional-level indicators may capture quite some variation in business formation, there may be unobserved heterogeneity, e.g., political attitudes towards new businesses, trust, and local eco-system factors that are not directly measurable but are typically relatively stable over time. For these reasons, we include region-fixed effects (c_k). Moreover, we include year-fixed effects (λ_t) that capture general technology trends that may open up opportunities for new businesses or changes in regulations that affect business dynamics. To extend the main specification, we further analyze whether the role of networks differs depending on the region type. For instance, there may be a 'small community markup' of social capital (Bauernschuster, Falck, & Heblich, 2010), which could result in higher relevance of local business networks in rural areas.

Because the region type is fixed, we cannot estimate the fixed effects specification when we include interaction terms of the region type with the average degree. We therefore estimate the model as:

$$\begin{aligned} \#BusinessFormation_{t,k} = \beta_0 + \beta_1 AverageDegree_{t-1,k} + \\ \beta_2 AverageDegree_{t-1,k} \times Urban_k + \beta_3 Urban_k + X_{tk}\gamma + M_k\delta + \lambda_t + \epsilon \end{aligned} \tag{3}$$

when testing for regional heterogeneity in the link between network structures and new business formation.

[14] This information stems from the MUP data.

3.1 Further extensions and endogeneity of the network

Following earlier studies on the link between market or industry structure and firm activities (O'Brien & Salop, 2000; Gibbon & Schain, 2022), we construct measures for ownership concentration to analyze its role in new business formation. Conceptually, concentration in ownership is different from interconnected ownership, but it is interesting to compare these measures. Therefore, we construct a type of Herfindahl-Hirschman Index (HHI) based on the ownership shares of ultimate owners (LUOC) in the MUP data. Ultimate owners are the last firm in the ownership chain that holds more than 1% of the shares. We square and aggregate all shares of an owner by region and year. We normalize the shares such that they are between zero and one following (Cracau & Lima, 2016). Our measure of ownership concentration captures the distribution of shares rather than market shares (O'Brien & Salop, 2000; Gibbon & Schain, 2022). While both measures capture concentration, the former is more plausible and feasible in our context given that regional market shares are often unknown and we are mainly interested in influence on corporate decision-making. To investigate this further, we estimate models in line with the ones above using the ownership concentration instead of (and in addition to) the network measures.

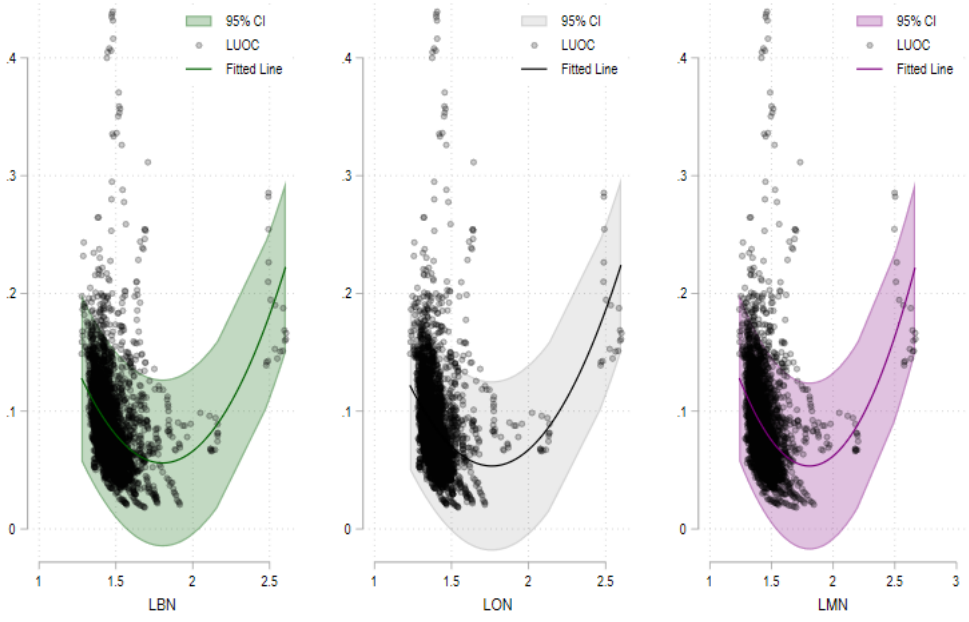

Figure 5: Correlation between the LUOC and the Average Degree of LBN, LON, and LMN

Moreover, with the aim to address the concern that the count of new businesses is skewed

and no continuous metric variable, we estimate Poisson fixed-effects models to account for the nature of the dependent variables. Finally, we address endogeneity concerns regarding the network structure by using an instrumental variable (IV) approach. Since it is conceptually hard to find IVs that predict the network but not business formation directly, we follow (Lewbel, 2012) who developed a two-stage least squares regression approach that identifies appropriate instrumental variables from the heteroskedasticity within the data, which fulfill all formal requirements. One pre-condition is that the first-stage errors are indeed heteroscedastic. In our case, this is the case for the endogenous variables, i.e. the average degree measures LBN, LON, and LMN. See section 4 for a more detailed discussion.

3.2 Descriptive statistics

Table 1 shows descriptive statistics for the main variables of interest. The unit of analysis is the labour market region, of which 115 are urban and 142 are rural/peripheral. Serial entrepreneurship (mean 146.22) is rarer than de-novo business formation (mean 313.26). Not surprisingly, urban labor market regions display higher numbers of serial and de-novo business formations than rural/peripheral areas. The average degree is higher for LBNs than for LMNs and LONs. This reflects that LBNs capture all links. The average degree is considerably higher in urban regions, but the order of the relative values of the different network definitions is similar. However, the range of values is higher in rural/peripheral locations as compared to urban areas[15]. When looking at the correlations between the LUOC and our network measures, we find a negative correlation, i.e., in regions with higher ownership concentration, networks seem to be less well connected (see Table A.2). However, as Figure 5 shows, there seems to be a U-shape with the most interconnected regions also showing higher ownership concentration. When looking at differences between urban and peripheral/rural areas in Figure A.3, we see that the negative correlation is somewhat stronger in urban areas, while in other regions, there seems to be a more complex link as reflected in the more extreme distribution towards both ends of the degree distribution as in the ownership concentration values. Table A.3 in the Appendix shows descriptive statistics for the regional controls as well as the industry distribution[16] and Table A.2 shows pair-wise correlations between the network

[15]This pattern is similar when using the second definition.

[16]We obtain this information from administrative data provided by the Federal Statistics Office.

measures, ownership concentration (LUOC), and the different types of new businesses (counts and logged counts).

Table 1: Descriptive Statistics (Full sample and Urban vs. Rural/Peripheral)

	Mean	Std. Dev.	Min	Max
Overall N=4883				
De-Novo entrepreneurship (DN)	313.259	534.240	16.000	6354.000
Serial entrepreneurship (SE)	146.224	363.564	0.000	5014.000
Average Degree LBN	1.466	0.115	1.275	2.605
Average Degree LON	1.395	0.109	1.230	2.601
Average Degree LMN	1.433	0.118	1.237	2.664
Urban N=2185				
De-Novo entrepreneurship (DN)	521.580	739.685	24.000	6354.000
Serial entrepreneurship (SE)	258.037	519.547	0.000	5014.000
Average Degree LBNn	1.485	0.086	1.313	1.913
Average Degree LON	1.405	0.066	1.254	1.715
Average Degree LMN	1.446	0.080	1.259	1.840
Rural/Peripheral N=2698				
De-Novo entrepreneurship (DN)	144.549	99.731	16.000	908.000
Serial entrepreneurship (SE)	55.672	48.459	1.000	411.000
Average Degree LBN	1.451	0.132	1.275	2.605
Average Degree LON	1.386	0.134	1.230	2.601
Average Degree LMN	1.423	0.141	1.237	2.664

NOTES: Displayed are means, standard deviations, and minimum and maximum values of the main variables. Serial and de-novo founders are defined using the time constraint following the first definition of founders.

4 Results

Following the specification presented in Equation 1, we first evaluate the effect of the overall connectedness of LBN on the business formation of serial and de-novo entrepreneurship. See Table 2 (Panel A) for the results. The first specification includes year-fixed effects in the models for SE and DN, respectively (columns (1) and (2)). In further steps, we add regional controls (columns (3) and (4)), controls on the firm structure (columns (5) and (6)), and labor market fixed effects (columns (7) and (8)). In the first specifications, the average degree is positively associated with business formation for serial and de-novo entrepreneurs up to a certain point. However, if networks are too interconnected, the negative coefficient of the quadratic term reduces the positive main effect. The average marginal effect is 1.554 [95% confidence interval: 0.475 - 2.634], i.e., suggesting that there is - on average - a positive relationship between network connectedness and business formation by serial entrepreneurs. When adding regional and firm-level controls in the following specifications, this pattern persists for serial entrepreneurs only. This indicates that the network structure is more decisive for serial than de-novo entrepreneurs.

When we compare the results for LBN to those of LON (Panel B) and LMN (Panel C), we find that the patterns are quite consistent. For local ownership networks, we find that the first order term in specification 8 is positive and statistically significant at the 10% level, even for de-novo entrepreneurs. Looking at local management networks, the results for serial entrepreneurs also hold, and the patterns of the coefficients are also significant for de-novo entrepreneurs (when including year fixed effects, the full set of controls, and fixed effects), but the magnitude of the relationship is still smaller for first-time founders despite the larger mean of the dependent variable. These results are robust to estimating Poisson models using the count of new business registrations (see Table A.5). Using the second definition of founders, the results are very similar for serial entrepreneurs, but here we see also for de-novo founders that better connected local networks come with higher founding rates (Table A.6).

4.1 Endogeneity of the network

Due to the networks' nature and the connections' potential endogeneity, we present the results using synthetic IVs (Lewbel, 2012). For this approach, a sufficient degree of heteroscedasticity

Table 2: Local Networks and New Business Formation (OLS Regression Results)

	(1) SE	(2) DN	(3) SE	(4) DN	(5) SE	(6) DN	(7) SE	(8) DN
Panel A								
Average degree (LBN)	32.88***	26.99***	2.985***	-0.642	2.871***	-0.502	10.70***	2.421
	(3.295)	(3.085)	(0.801)	(1.052)	(0.803)	(1.045)	(2.332)	(1.647)
Average degree^2 (LBN)	-8.282***	-6.877***	-0.608***	0.262	-0.587***	0.225	-3.119***	-0.471
	(0.885)	(0.818)	(0.202)	(0.284)	(0.203)	(0.282)	(0.678)	(0.451)
Constant	-26.06***	-19.46***	-15.61	-14.81	-18.61	-17.16	14.42	-20.28
	(2.932)	(2.763)	(16.70)	(14.69)	(16.26)	(14.47)	(30.49)	(31.63)
R-squared	0.459	0.375	0.927	0.932	0.927	0.933	0.961	0.970
Panel B								
Average degree (LON)	32.03***	25.88***	3.306***	-0.154	3.163***	-0.0592	9.876***	2.769*
	(4.141)	(3.848)	(0.798)	(1.074)	(0.807)	(1.071)	(2.352)	(1.629)
Average degree^2 (LON)	-8.286***	-6.776***	-0.699***	0.137	-0.670***	0.112	-2.990***	-0.583
	(1.147)	(1.053)	(0.203)	(0.292)	(0.206)	(0.291)	(0.706)	(0.461)
Constant	-24.21***	-17.60***	-17.72	-15.80	-20.54	-18.08	17.69	-20.45
	(3.550)	(3.316)	(16.78)	(14.73)	(16.37)	(14.50)	(30.92)	(31.44)
R-squared	0.386	0.309	0.927	0.932	0.928	0.933	0.961	0.970
Panel C								
Average degree (LMN)	31.28***	25.30***	3.756***	0.0708	3.621***	0.150	6.989***	2.983**
	(3.745)	(3.460)	(0.738)	(1.023)	(0.758)	(1.020)	(1.734)	(1.279)
Average degree^2 (LMN)	-7.880***	-6.449***	-0.795***	0.0789	-0.768***	0.0577	-2.120***	-0.653*
	(1.011)	(0.921)	(0.186)	(0.272)	(0.191)	(0.271)	(0.482)	(0.338)
Constant	-24.29***	-17.70***	-19.69	-16.56	-22.33	-18.75	21.44	-18.69
	(3.292)	(3.063)	(16.35)	(14.66)	(15.97)	(14.44)	(31.25)	(31.56)
R-squared	0.417	0.336	0.928	0.932	0.928	0.933	0.961	0.970
Observations	4,883	4,883	4,883	4,883	4,883	4,883	4,883	4,883
DV Mean	4.234	5.228	4.234	5.228	4.234	5.228	4.234	5.228
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Regional Controls	NO	NO	YES	YES	YES	YES	YES	YES
Firm Structure Controls	NO	NO	NO	NO	YES	YES	YES	YES
LMR FE	NO	NO	NO	NO	NO	NO	YES	YES

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the natural logarithm plus one for de-novo (Ln(DN+1)) and serial entrepreneurship (ln(SE+1)) new business formation respectively. The founder is identified using time constraints only (first definition).

in the main link between the network measures and the business formation rates is required. Test statistics provided in Table 3 show that this requirement is fulfilled in our case. We do not overidentify our model and have as many generated exogenous instruments as endogenous predictors. We perform a test for the presence of weak instruments and find the Kleibergen-Paap Wald F-statistics above the rule-of-thumb critical values ranging between 132 and 147 (Stock & Yogo, 2005). Therefore, we can reject concerns about weak instruments using this approach. Using the most strict specification (comparable to the OLS estimates from Table 2 columns (7) and (8)), we provide estimates for LBN (columns (1) and (2)) as well as LON (columns (3) and (4)) and LMN (columns (5) and (6)). The IV estimates confirm the direction of the previous results for LBN. In line with the previous findings, the serial entrepreneurship business formation estimates are statistically significant but those of de-novo entrepreneurship lack precision. Thus, we cannot confirm the statistical significance of LON and LMN effects

Table 3: Local Networks and New Business Formation (Lewbel IV Regression Results)

	(1) SE	(2) DN	(3) SE	(4) DN	(5) SE	(6) DN
Average degree (LBN)	13.09***	1.940				
	(3.601)	(2.295)				
Average degree^2 (LBN)	-3.626***	-0.352				
	(1.059)	(0.628)				
Average degree (LON)			10.44***	1.670		
			(3.390)	(2.163)		
Average degree^2 (LON)			-2.976***	-0.270		
			(1.009)	(0.604)		
Average degree (LMN)					8.330***	2.276
					(2.711)	(1.768)
Average degree^2 (LMN)					-2.438***	-0.473
					(0.754)	(0.466)
Observations	4,883	4,883	4,883	4,883	4,883	4,883
R-squared	0.664	0.684	0.664	0.684	0.664	0.684
DV Mean	4.234	5.228	4.234	5.228	4.234	5.228
Year FE	YES	YES	YES	YES	YES	YES
Regional Controls	YES	YES	YES	YES	YES	YES
Firm Structure Controls	YES	YES	YES	YES	YES	YES
LMR FE	YES	YES	YES	YES	YES	YES
Kleinberg-Paap LM	142.4	142.4	132.4	132.4	147.4	147.4
LM P-Val.	0.001	0.001	0.001	0.001	0.001	0.001
Hansen Chi-sq.	110.3	101.7	106.4	101.4	110.1	108
Hansen P-Val.	0.040	0.119	0.068	0.123	0.041	0.055
Het. test Chi-sq.	366.9	3.938	375.3	3.892	368.1	3.859
Het. test P-Val.	0.000	0.047	0.000	0.049	0.000	0.050

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the natural logarithm plus one for de-novo (Ln(DN+1)) and serial entrepreneurship (ln(SE+1)) new business formation, respectively. The founder is identified using time constraints only (first definition).

on de-novo business formation in the IV models.

Following the idea that these networks might affect the process of business formation differently in urban and rural/peripheral areas, we further estimate the model allowing this kind of differentiation. Since being an urban or rural area is a time-invariant characteristic of a labor market region, we drop the region fixed effects for this specification while the other controls and the year fixed effects stay in place. The results from the Lewbel IV estimations in Table 4 suggest no significant differences for urban vs. rural/peripheral regions for LBN and LMN since all interaction terms are insignificant. The result of a positive but diminishing link between networks and new business formation for serial entrepreneurs persists.

When considering the HHI of ownership concentration (LUOC) instead of the average degree, we find that for serial entrepreneurs, the coefficient of the second order term is negative, suggesting that high ownership concentration comes indeed with lower new business formation. For de-novo founders, the first-order term is negative and significant, but as soon as we control for other regional characteristics, the sign flips. For serial entrepreneurs, the first-order

Table 4: Local Networks and New Business Formation in Urban vs. Rural/Peripheral areas (Lewbel IV Regression Results)

	(1) SE	(2) DN	(3) SE	(4) DN	(5) SE	(6) DN
Urban	-0.316	-0.447	-2.692	-0.759	-0.921	-1.143
	(1.223)	(1.304)	(2.166)	(2.359)	(1.198)	(1.281)
Average degree (LBN)	10.08***	-0.637				
	(2.912)	(2.373)				
Average degree^2 (LBN)	-2.627***	0.617				
	(0.818)	(0.649)				
Average degree (LBN)#Urban	0.253	0.345				
	(1.158)	(1.235)				
Average degree^2 (LBN)#Urban	-0.0233	-0.0279				
	(0.152)	(0.163)				
Average degree (LON)			9.269***	1.018		
			(3.063)	(2.302)		
Average degree^2 (LON)			-2.521***	0.140		
			(0.893)	(0.642)		
Average degree (LON)#Urban			2.656	0.633		
			(2.185)	(2.381)		
Average degree^2 (LON)#Urban			-0.380	-0.0577		
			(0.326)	(0.356)		
Average degree (LMN)					6.930***	1.459
					(2.152)	(1.781)
Average degree^2 (LMN)					-1.853***	0.0211
					(0.565)	(0.460)
Average degree (LMN)#Urban					0.797	0.999
					(1.171)	(1.253)
Average degree^2 (LMN)#Urban					-0.0863	-0.108
					(0.164)	(0.176)
Constant	0.008	0.013	0.010	0.014	0.014*	0.012
	(0.009)	(0.009)	(0.010)	(0.010)	(0.008)	(0.008)
Observations	4,883	4,883	4,883	4,883	4,883	4,883
R-squared	0.660	0.667	0.658	0.666	0.656	0.667
DV Mean	4.234	5.228	4.234	5.228	4.234	5.228
Year FE	YES	YES	YES	YES	YES	YES
Firm Structure Controls	YES	YES	YES	YES	YES	YES
Kleinberg-Paap LM	241.8	241.8	233.5	233.5	248.1	248.1
LM P-Val.	0.008	0.008	0.020	0.020	0.003	0.003
Hansen Chi-sq.	202.1			203.8	198.7	214.5
Hansen P-Val.	0.261	n.e.	n.e.	0.234	0.318	0.108
Het. test Chi-sq.	370.4	3.626	370.4	3.486	379.2	3.616
Het. test P-Val.	0.000	0.057	0.000	0.062	0.000	0.057

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. SE and DN captures the natural logarithm of (SE+1) and (DN+1) respectively. The founder is identified using time constraints only (first definition); n.e. stands for not estimable.

term of our network measures becomes positive and significant when controlling for regional controls and firm structure, while the second-order term remains negative. Thus, for serial entrepreneurs, the pattern is quite comparable to the one using the average degree measure. However, when including labor market fixed effects, the estimates become less precise. We also explore the joint inclusion of both measures related to our dependent variables (Table 6). Interestingly, high ownership concentration is still negatively and significantly correlated to serial entrepreneurship across all specifications, whereas de-novo founding rates do not depend on local ownership patterns. For the average degree of LBN, LON, and LMN, we find similar patterns as in Table 2 even though we additionally include the LUOC. We test

the robustness of these findings to instrumentation and present the results from this exercise in Table 7. They show that while the network effects are robust, this is not the case for ownership concentration. The signs of the coefficients remain consistent with the previous results for serial entrepreneurs but not for new founders.

Table 5: Local Ownership Concentration and New Business Formation (OLS Regression Results)

	(1) SE	(2) DN	(3) SE	(4) DN	(5) SE	(6) DN	(7) SE	(8) DN
LUOC	0.029	-0.311**	0.241***	0.039	0.237**	0.055	0.442	-0.742
	(0.116)	(0.122)	(0.093)	(0.086)	(0.094)	(0.085)	(0.735)	(0.815)
$LUOC^2$	-0.698*	0.210	-1.208***	-0.496	-1.175***	-0.575*	-2.320	0.596
	(0.420)	(0.357)	(0.389)	(0.329)	(0.391)	(0.328)	(1.556)	(1.648)
Constant	0.004	0.026***	-0.010*	0.001	-0.010*	0.001	-0.018	0.060
	(0.007)	(0.008)	(0.005)	(0.006)	(0.005)	(0.005)	(0.051)	(0.058)
Observations	4,883	4,883	4,883	4,883	4,883	4,883	4,883	4,883
R-squared	0.630	0.557	0.659	0.680	0.659	0.683	0.660	0.683
DV Mean	4.234	5.228	4.234	5.228	4.234	5.228	4.234	5.228
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Regional Controls	NO	NO	YES	YES	YES	YES	YES	YES
Firm Structure Controls	NO	NO	NO	NO	YES	YES	YES	YES
LMR FE	NO	NO	NO	NO	NO	NO	YES	YES

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. HHI stands for the lagged and normalized Herfindal-Hirschman Index.SE, and DN captures the natural logarithm of (SE+1) and (DN+1), respectively. The founder is identified using time constraints only (first definition).

Table 6: Local Ownership Concentration, Local Networks, and New Business Formation (OLS Regression Results)

VARIABLES	(1) SE	(2) DN	(3) SE	(4) DN	(5) SE	(6) DN
LUOC	0.526	-0.650	0.571	-0.623	0.545	-0.686
	(0.721)	(0.808)	(0.711)	(0.803)	(0.722)	(0.808)
$LUOC^2$	-3.043**	0.152	-3.105**	0.0881	-3.030*	0.173
	(1.538)	(1.632)	(1.517)	(1.628)	(1.556)	(1.646)
Average degree (LBN)	11.340***	2.862*				
	(2.434)	(1.708)				
Average $degree^2$ (LBN)	-3.281***	-0.587				
	(0.716)	(0.474)				
Average degree (LON)			10.520***	3.195*		
			(2.439)	(1.685)		
Average $degree^2$ (LON)			-3.161***	-0.700		
			(0.741)	(0.484)		
Average degree (LMN)					7.586***	3.419**
					(1.827)	(1.353)
Average $degree^2$ (LMN)					-2.273***	-0.764**
					(0.518)	(0.365)
Constant	9.369	-23.420	12.870	-23.450	16.820	-21.840
	(30.180)	(31.350)	(30.600)	(31.140)	(31.030)	(31.260)
Observations	4,883	4,883	4,883	4,883	4,883	4,883
R-squared	0.961	0.970	0.961	0.970	0.961	0.970
DV Mean	4.234	5.228	4.234	5.228	4.234	5.228
Year FE	YES	YES	YES	YES	YES	YES
Regional Controls	YES	YES	YES	YES	YES	YES
Firm Structure Controls	YES	YES	YES	YES	YES	YES
LMR FE	YES	YES	YES	YES	YES	YES

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. LUOC is the lagged and normalized Herfindal-Hirschman Index of local ultimate owner concentration. SE and DN captures the natural logarithm of (SE+1) and (DN+1) respectively. The founder is identified using time constraints only (first definition).

4.2 Alternative Definition of Entrepreneurs

As mentioned earlier, the definition of a founder is somewhat ambiguous and subject to assumptions. Therefore, we re-estimated all models using definition two with stricter inclusion criteria. Table A.4 shows the main results corresponding to Table 2. The results are quite similar, with a positive but diminishing link between connectedness and new business formation. This link is only consistently significant for serial entrepreneurs. However, the last specification in Panel C is interesting as for de-novo founders, local management networks also seem to matter. While in the correlational model, this pattern is present for all types of networks, the IV model (Table A.8) only confirms the statistical significance for local management networks in the case of serial entrepreneurs. This finding is interesting since it stresses the importance of going beyond the measurement of ownership structures and taking manager networks into

Table 7: Local Ownership Concentration, Local Networks, and New Business Formation (Lewbel IV Regression Results)

VARIABLES	(1) SE	(2) DN	(3) SE	(4) DN	(5) SE	(6) DN
LUOC	1.202	-0.811	1.046	-0.844	1.753	-1.009
	(1.468)	(1.369)	(1.414)	(1.382)	(1.558)	(1.365)
$LUOC^2$	-4.466	-0.596	-4.085	-0.550	-6.279	-0.457
	(3.522)	(3.266)	(3.348)	(3.322)	(4.003)	(3.228)
Average degree (LBN)	13.92***	2.022				
	(3.066)	(2.081)				
Average $degree^2$ (LBN)	-3.844***	-0.365				
	(0.902)	(0.565)				
Average degree (LON)			11.72***	1.626		
			(2.890)	(1.875)		
Average $degree^2$ (LON)			-3.349***	-0.248		
			(0.863)	(0.516)		
Average degree (LMN)					9.358***	2.799
					(2.421)	(1.806)
Average $degree^2$ (LMN)					-2.717***	-0.610
					(0.684)	(0.483)
Observations	4,883	4,883	4,883	4,883	4,883	4,883
R-squared	0.665	0.685	0.665	0.684	0.664	0.684
DV Mean	4.234	5.228	4.234	5.228	4.234	5.228
Year FE	YES	YES	YES	YES	YES	YES
Regional Controls	YES	YES	YES	YES	YES	YES
Firm Structure Controls	YES	YES	YES	YES	YES	YES
LMR FE	YES	YES	YES	YES	YES	YES
Kleinberg-Paap LM	202.9	202.9	202.9	202.9	206.1	206.1
LM P-Val.	0.060	0.060	0.060	0.060	0.043	0.043
Hansen Chi-sq.	176	189.2	178.5	189.4	174.8	194.9
Hansen P-Val.	0.401	0.175	0.352	0.173	0.427	0.111

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. LUOC is the lagged and normalized Herfindal-Hirschman Index of local ultimate owner concentration. SE and DN captures the natural logarithm of (SE+1) and (DN+1) respectively. The founder is identified using time constraints only (first definition).

account. We also re-run the Poisson models, which also confirm previous patterns for this stricter definition of founders: More connected local networks promote new firm entry, but only up to a point where the association diminishes or even reverses (Table A.6).

4.3 Nature of New Firms

To better understand the types of businesses being created, we further investigate how local business networks relate to initial firm size, firm growth, and survival. To do so, we introduce six new measures:

1. The number of firms in a year that *entered* the labor market with at least three employees

($Entry_3$)

2. Firms that are likely spin-outs or spin-offs of other organization, i.e., have at least 20 employees in their founding year ($Entry_{20}$)

3. The number of firms that have at least twenty employees in their *fifth year* ($Size_{20}$)

4. The number of firms that *grow* from three to ten employees to at least twenty employees within the first five years ($Growth_{20}$)

5. The share of firms surviving their second year ($Survival_2$)

6. The share of firms surviving their fifth year ($Survival_5$)

The first three measures show whether networks contribute to larger firms entering the regional market. In the most extreme case, these could be spin-outs of existing companies within the network rather than new organizations. Firms that are larger could be an indication of the network facilitating access to human capital or financial resources. That is, the network provides specific incentives for entry because of a start-up advantage. The fourth measure reflects dynamism in the new firms, i.e., the employment growth over the first five years. The last two measures indicate the sustainability of new businesses as shown by their survival beyond the initial stages. As new ventures are most vulnerable in the first years after founding, the other two measures evaluate the robustness of these ventures. Investigating the question of whether there is a link between networks and the survival of new businesses is interesting because it allows one to conclude the quality or validity of the business model as well as network effects on the structure of regions (i.e., the contribution to the stock of firms) in the medium to long-run.

The results based on IV estimations are presented in Table 8. They show that for serial entrepreneurs (Panel A), the more connected a region, the higher the number of firms that start with at least three employees, although the positive link diminishes as regions are highly connected (1). We see no significant effects when looking at the number of firms that start large, i.e., with 20 or more employees, indicating that the overall effect is not entirely driven by spin-offs (2). Considering firm size in year five, we also find that the number of such businesses is larger, if the region is more connected (3). The results in column (4) suggest no

link between networks and firm growth for serial entrepreneurs. For de-novo businesses, we do find a negative relationship between LBN and such businesses (Column 4, Panel B).

Finally, in terms of survival we find that more new businesses survive the two-year and five-year threshold if the region is better connected for serial and de-novo entrepreneurs. This indicates that there is value from LBN to be realized also for de-novo founders conditional on entering, although it does significantly affect the entry decision.

Table 8: Local Networks and Firm Characteristics (Lewbel Results)

	(1) LN($Entry_3$)	(2) LN($Entry_{20}$)	(3) LN($Size_{20}$)	(4) LN($Growth_{20}$)	(5) $Survival_2$	(6) $Survival_5$
Panel A: SE Firms						
Average degree (LBN)	3.614**	0.837	2.596**	-1.077	0.301**	0.537***
	(1.740)	(0.955)	(1.279)	(1.553)	(0.121)	(0.208)
Average degree^2 (LBN)	-0.769*	-0.231	-0.490	0.529	-0.0711**	-0.133**
	(0.433)	(0.230)	(0.319)	(0.390)	(0.0305)	(0.0518)
Observations	4,883	4,883	4,883	4,883	4,882	4,368
R-squared	0.797	0.415	0.880	0.651	0.030	0.047
DV Mean	6.20e-09	1.05e-09	-1.89e-08	7.92e-09	1.95e-10	9.48e-10
Kleinberg-Paap LM	76.36	76.36	76.36	76.36	76.37	77.47
LM P-Val.	0.0123	0.0123	0.0123	0.0123	0.0122	0.00983
Hansen Chi-sq.	86.04	42.87	67.90	69.41	53.74	51.84
Hansen P-Val.	0.00116	0.752	0.0468	0.0359	0.333	0.402
Panel B: DN-Firms						
Average degree (LBN)	0.696	-1.309	-1.316	-5.010**	0.314**	0.697***
	(2.246)	(1.514)	(1.595)	(2.259)	(0.159)	(0.230)
Average degree^2 (LBN)	-0.0694	0.324	0.434	1.406**	-0.0841**	-0.185***
	(0.576)	(0.376)	(0.410)	(0.574)	(0.0406)	(0.0583)
Observations	4,883	4,883	4,883	4,883	4,883	4,369
R-squared	0.854	0.462	0.920	0.754	0.095	0.146
Kleinberg-Paap LM	76.36	76.36	76.36	76.36	76.36	77.45
LM P-Val.	0.0123	0.0123	0.0123	0.0123	0.0123	0.00988
Hansen Chi-sq.	61.43	46.37	65.08	50.54	59.03	54.72
Hansen P-Val.	0.129	0.620	0.0744	0.452	0.179	0.300
Year FE	YES	YES	YES	YES	YES	YES
Regional Controls	YES	YES	YES	YES	YES	YES
Firm Structure Controls	YES	YES	YES	YES	YES	YES
LMR FE	YES	YES	YES	YES	YES	YES

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. .

5 Discussion and Conclusion

New business formation has long been understood to be an important driver of innovation and regional development (Acs & Audretsch, 1988; Audretsch & Peña-Legazkue, 2012; Haltiwanger et al., 2013; Haltiwanger, 2022). It is less well understood how local business structures affect the entry of entrepreneurs. This paper set out to investigate the relationship between local business networks and the birth of new businesses as well as their nature. Previous research expressed concerns about declining business dynamism, including declining or stagnating new business creation (Decker et al., 2016, 2020; Haltiwanger, 2022). At the same time, business dynamism seems to be related to market power (Syverson, 2019), raising the question of whether there is a systematic link between the two phenomena.

Overlapping ownership may work as an entry barrier to entrepreneurs, reducing their willingness to enter already highly connected regions. Intense connections between actors could come with restricted access for outsiders due to competition over resources (such as human capital) or foreclosure of local markets. However, regions in which businesses are well connected in terms of ownership or through managerial links may build up higher social capital. Such capital can be seen as a valuable resource incentivizing and facilitating entry. Social capital can thereby augment traditional input factors such as physical capital and labor (Bourdieu, 1980; Coleman, 1988). The benefits of social capital in the context of regional networks (Westlund & Bolton, 2003), however, may be rather be available to those with access to the network. In our context, this implies that entrepreneurs who are well-connected to the network profit more from the social capital available in the region than newcomers.

Building on these ideas, this paper links research from regional economics, entrepreneurship, industrial dynamics, as well as social interactions to shed light on the role of regional business networks in new business formation. We measure business networks using the average degree, a measure taken from social network analysis, to map the interconnection of firms and stakeholders active within a region. Differentiating between serial and de-novo entrepreneurs, we study whether serial entrepreneurs benefit from stronger network ties as they are already part of the network. Non-members - de-novo entrepreneurs - might be discouraged or at least not encouraged by stronger networks.

Our results are based on large-scale data on all active businesses founded between 2002

and 2020. We show that local business networks are indeed an important determinant of new business formation by serial entrepreneurs but not by inexperienced founders. This holds for different types of networks, i.e., based on ownership and top management roles. Our main result is a positive but diminishing effect between the connectedness of the local business network and new business formation held in urban as well as rural/peripheral regions. While we find that networks in rural areas show a higher variance in the average degree, we cannot find support for the idea that this affects their link to new business formation differently than in urban areas. The findings imply that accounting for local business networks and the rise in the average connectedness over time in the analysis of business dynamics is crucial. The result that serial entrepreneurs benefit more than others could explain why the decline in new business creation by experienced founders is less than that for new founders in our context. Tightening networks, however, do not seem to explain the decline in de-novo entry. However, we find that networks are positively linked to the share of firms surviving the first five years for both serial and de-novo founders. This indicates - in line with social capital theory - that once founders have become part of the club, they benefit from the connection and the social capital shared within the network.

To the best of our knowledge, our study is the first to measure local business networks comprehensively and to link them to entry incentives based on the entrepreneurial experience of the founders. While our results suggest that denser networks or higher ownership concentration is not at the heart of declining startup rates, it becomes apparent that only experienced entrepreneurs benefit from the network. This finding aligns with the earlier insight that entrepreneurial activities are becoming more exclusive (Karahan, Pugsley, & Şahin, 2019; Salgado, 2020). Our finding that serial entrepreneurs benefit more than de-novo founders at the extensive margin may suggest that the former have stronger absorptive capacities that allow them to better use information within the network. This is in line with findings showing that serial entrepreneurs perform better - not because of learning - but mainly as a result of selection on ability (Chen, 2013). It is an open question, however, what this implies for the innovativeness of firms and markets.

Finally, we find that variation in regional concentration in ownership cannot explain new business formation once we account for the network structure directly. This finding adds to recent research on common ownership as a measure of indirect networks between companies

(Gibbon & Schain, 2022). Moreover, the findings add to the discussion by showing that managerial networks deserve more attention in follow-up research. The key result, i.e., that we see a higher number of new businesses founded by serial entrepreneurs in more connected regions, suggests that connections benefit insiders more than outsiders. It also resembles the idea that access to important resources incentivizes entry. Yet, we cannot support the hypothesis that the decline in de-novo entrepreneurship can be attributed to increasing connectedness and the exclusion of newcomers. The finding that survival is better in more connected regions suggests that at the intensive margin, de-novo entrepreneurs benefit as well. In this sense, the study also contributes research on the effects of competition on innovation (Haucap, Rasch, & Stiebale, 2019) by showing that new business formation as a driver of innovation can be higher, the more connected the location, but that entry will be driven by serial entrepreneurs. If these are indeed more innovative and successful (Lafontaine & Shaw, 2016), overall innovation may benefit from denser networks. If they are not (Nielsen & Sarasvathy, 2016), we may see too much attraction of these types of entrepreneurs with implications for innovation.

Although this study provided novel insights, it comes with some limitations. Looking at aggregate numbers of business formations and their relation to local networks comes with the challenge of identifying causal relationships. We relied on synthetic instrumental variables but did not explore changes to the network through exogenous variation. There may also be some individual-level determinants of entrepreneurial activity not accounted for in this study. Prior research documents, for instance, differences in personality traits and hence entrepreneurial orientation across regions (Runst & Thomä, 2022). These differences may also be time-varying in the presence of immigration and emigration. A better understanding of network formation and the underlying processes will allow deeper analyses of these influences. However, identifying causal effects is difficult if individual attributes of founders, teams, and products are unobserved. Moreover, one of our assumptions relates to identifying serial entrepreneurs and that they are indeed linked to a local network. We encourage further research on human capital and absorptive capacities in more detail. Finally, we did not differentiate between teams and solopreneurs. The latter are often different regarding growth ambitions, innovativeness, and performance. Looking deeper into this differentiation in future research could be very valuable.

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A Appendix

A.1 Additional Figures and Founder Definition

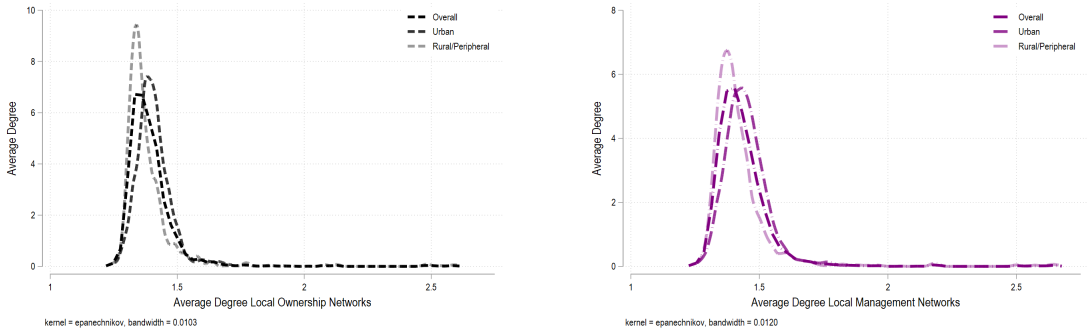

Figure A.1: Distribution of the Average Degree

In the main part of our analysis, we defined a person as a founder if she has some active role in a new firm from the beginning. The second definition, however, is also plausible although more restrictive. Here, we only consider someone as a founder if she is a majority shareholder with a managing position in the company. Figure A.2 graphically illustrates the definitions for an example setting. The calculation of the respective ownership shares requires, for example, a multiplication of all the different shares that the individual holds in one firm, and the shares of other forms that hold shares in that firm and so on. The algorithm finding majority owners with managerial positions can be described as follows: (1) Merge stakeholder information to the firm; (2) Keep stakeholders which are firms; (3) keep stakeholders involved in the firm who have been involved at least since the firm founded in iteration (1); (4) save the data and repeat (2) to (4); (5) merge data backwards; (6) keep managing stakeholders which have been also identified to be involved in the majority shareholding firm. In this example, managing directors 1 and 2 are founders of firm A according to the first definition since they both started in February 2005 when the firm was founded. Using the second (stricter) definition, only managing director 2 is a founder because she has also a managing position since February 2005 in firm B holding the majority shares of the initial firm A.

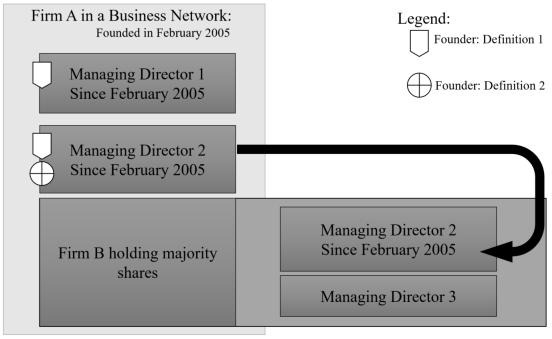

Figure A.2: Definition of Serial Entrepreneurs

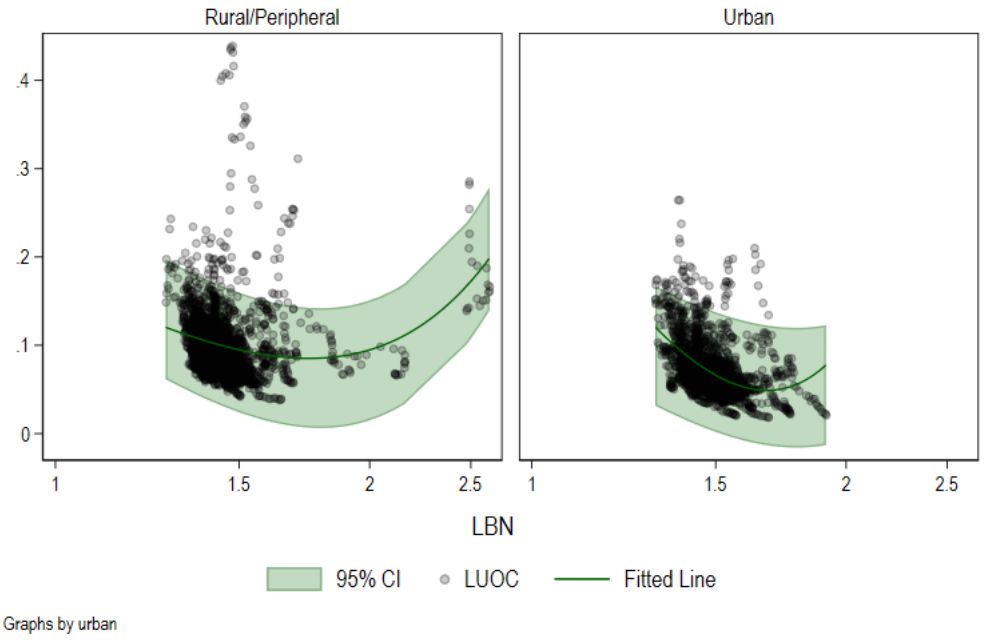

Figure A.3: Correlation between the HHI and the Average Degree of LBN, LON, and LMN by Region Type

A.2 Additional Tables

Table A.1: Transitions between Sectors Entrepreneurship (Founder Definition 1)

NACE	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
I) PROBABILITY TO TRANSITION																		
B	16.27	5.69	2.55	3.14	5.88	10.98	2.16	0.78	0.78	8.24	8.82	19.61	9.80	0.20	0.20	0.39	0.98	3.53
C	0.09	20.76	3.93	0.37	3.69	12.68	1.67	2.05	4.43	8.94	5.82	19.51	10.42	0.05	0.50	0.88	0.71	3.48
D	0.06	4.16	63.15	0.31	1.97	2.97	0.33	0.29	0.86	5.27	3.12	11.48	3.61	0.06	0.09	0.35	0.17	1.75
E	0.25	5.16	3.26	17.21	8.41	10.66	3.17	1.56	2.58	6.26	7.02	18.86	9.47	0.34	0.42	0.76	0.97	3.64
F	0.06	2.95	1.41	0.56	40.38	6.18	1.19	1.56	1.40	4.77	14.19	13.10	8.11	0.06	0.27	0.61	0.65	2.54
G	0.07	5.22	1.10	0.28	3.43	39.06	2.12	2.96	4.75	6.11	5.41	15.26	8.28	0.05	0.45	0.95	1.05	3.46
H	0.07	2.08	0.52	0.28	1.80	6.98	51.50	1.12	1.78	4.59	3.43	14.45	7.34	0.10	0.35	0.59	0.46	2.56
I	0.03	2.38	0.37	0.14	2.69	8.81	1.10	42.99	2.31	4.95	7.33	12.45	6.94	0.05	0.46	1.30	2.65	3.06
J	0.03	3.59	0.60	0.14	1.38	8.70	0.98	1.36	30.85	10.17	4.31	19.91	10.30	0.09	0.84	0.90	0.98	4.87
K	0.03	3.13	1.87	0.15	2.40	5.49	1.27	1.43	4.65	31.61	11.71	17.45	14.03	0.04	0.40	1.00	0.65	2.69
L	0.03	1.46	0.82	0.12	4.88	3.30	0.69	1.56	1.38	8.05	52.48	12.72	9.08	0.04	0.23	0.86	0.60	1.70
M	0.05	3.43	1.89	0.24	2.87	6.58	1.81	1.69	4.54	8.53	8.09	46.57	8.37	0.10	0.48	0.98	0.81	2.99
N	0.04	3.17	1.06	0.23	3.14	6.24	1.65	1.76	3.97	11.02	9.62	14.33	38.35	0.07	0.52	1.10	0.79	2.93
O	0.11	3.21	2.41	1.26	3.56	3.90	1.95	1.26	4.13	6.43	5.17	22.85	8.50	11.02	2.30	9.87	3.10	8.96
P	0.00	3.02	0.49	0.26	1.67	7.28	1.91	2.31	6.04	6.29	4.71	17.47	11.05	0.60	19.33	6.44	3.92	7.21
Q	0.01	1.64	0.51	0.17	1.61	4.15	0.70	1.91	2.66	5.32	6.17	11.26	7.39	0.43	2.20	47.25	1.16	5.44
R	0.02	2.24	0.54	0.19	2.56	7.74	0.92	6.78	3.85	5.05	6.20	13.26	7.34	0.16	1.75	1.63	34.58	5.18
S	0.06	3.72	1.71	0.35	3.58	9.28	2.07	2.88	6.78	8.12	7.13	18.37	10.83	0.22	1.25	2.98	1.90	18.78
II) FREQUENCY OF TRANSITIONS																		
B	83	29	13	16	30	56	11	4	4	42	45	100	50	1	1	2	5	18
C	28	6313	1196	113	1123	3856	507	622	1347	2717	1771	5932	3167	16	153	269	217	1059
D	18	1256	19053	93	595	896	100	87	260	1591	942	3463	1088	17	27	106	52	528
E	6	122	77	407	199	252	75	37	61	148	166	446	224	8	10	18	23	86
F	24	1178	565	222	16141	2472	477	624	559	1907	5672	5238	3242	25	107	244	259	1014
G	54	4153	875	220	2729	31075	1685	2352	3777	4862	4307	12142	6585	40	357	752	839	2756
H	17	493	122	67	427	1652	12186	264	421	1085	811	3419	1736	23	84	140	109	606
I	7	572	88	34	648	2122	265	10352	556	1193	1764	2999	1670	12	111	312	638	736
J	11	1435	240	54	553	3475	393	545	12327	4064	1722	7954	4117	35	336	358	391	1946
K	25	2423	1451	119	1861	4255	986	1105	3606	24491	9073	13523	10873	28	310	777	500	2084
L	28	1597	896	136	5328	3601	753	1704	1508	8793	57302	13886	9909	49	251	934	651	1861
M	96	6615	3648	454	5537	12686	3487	3262	8752	16452	15598	89833	16154	189	926	1889	1559	5760
N	41	3053	1020	223	3021	6007	1588	1695	3816	10599	9251	13785	36895	69	502	1061	761	2815
O	1	28	21	11	31	34	17	11	36	56	45	199	74	96	20	86	27	78
P	0	141	23	12	78	340	89	108	282	294	220	816	516	28	903	301	183	337
Q	1	239	75	25	235	605	102	279	388	776	899	1641	1077	62	321	6886	169	793
R	2	259	62	22	296	896	107	785	445	584	718	1535	849	19	203	189	4002	599
S	17	1011	464	95	971	2519	561	781	1839	2204	1934	4986	2939	59	339	810	516	5096

NOTES: Part I) of the table presents the probability in percent of serial entrepreneurs to found their next venture in the sector according to NACE B to NACE S codes.

Table A.2: Correlation Matrix for the Main Variables

	1	2	3	4	5	6	7	8	9	10	11
DN_1	1										
DN_2	0.979***	1									
SE_1	0.935***	0.853***	1								
SE_2	0.899***	0.871***	0.897***	1							
$\ln(DN_1)$	0.115***	0.170***	0.013	0.071***	1						
$\ln(SE_1)$	0.018	-0.001	0.103***	0.171***	0.091***	1					
$\ln(DN_2)$	0.115***	0.188***	-0.006	0.064***	0.957***	0.021	1				
$\ln(SE_2)$	0.043**	0.047***	0.083***	0.240***	0.227***	0.663***	0.215***	1			
LBN	0.358***	0.333***	0.375***	0.389***	-0.059***	0.140***	-0.077***	0.093***	1		
LON	0.266***	0.247***	0.283***	0.298***	-0.040**	0.107***	-0.054***	0.072***	0.982***	1	
LMN	0.277***	0.247***	0.318***	0.333***	-0.112***	0.206***	-0.137***	0.134***	0.981***	0.984***	1
LUOC	-0.357***	-0.361***	-0.314***	-0.344***	0.048***	-0.146***	0.064***	-0.084***	-0.140***	-0.077***	-0.127***

NOTES: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. DN_1 and SE_1 hereby stand for the total amount of serial and de-novo entrepreneurs according to the first definition and DN_2 SE_2 for the second accordingly. LBN, LON and LMN are abbreviations of the average degree of the different network measures. HHI stands for the normalized Herfindal-Hirschman Index.

Table A.3: Regional Control Variables

Overall (N=4883)				
ln(employees)	11.830	.767	10.413	14.662
ln(GDP)	8.732	.899	6.802	12.198
ln(unemployed)	8.908	.955	6.879	12.674
Net immigration	1053.525	3346.409	-5252	5415
Sector shares$_{t-1}$:				
Mining and quarrying (NACE B)	.096	.083	0	.952
Manufacturing (NACE C)	8.105	2.315	3.687	24.776
Electricity, gas, steam and air conditioning supply (NACE D)	.891	.893	0	7.914
Water supply; sewerage; waste management (NACE E)	.369	.150	.0638	1.105
Construction (NACE F)	13.761	3.245	5.999	24.979
Wholesale and retail; repair of motor vehicles (NACE G)	23.543	3.150	15.662	34.167
Transporting and storage (NACE H)	3.620	1.022	1.535	13.895
Accommodation and food service activities (NACE I)	7.058	1.771	3.911	17.762
Information and communication (NACE J)	2.427	.927	.664	6.542
Financial and insurance activities (NACE K)	4.395	.700	2.191	8.350
Real estate activities (NACE L)	4.231	.975	1.841	9.444
Professional, scientific and technical activities (NACE M)	10.106	2.175	5.594	17.015
Administrative and support service activities (NACE N)	6.028	1.038	3.219	10.085
Public administration and defence; social security (NACE O)	.067	.156	0	2.318
Education (NACE P)	1.176	.231	.504	2.180
Human health and social work activities (NACE Q)	5.472	.975	2.734	8.315
Arts, entertainment and recreation (NACE R)	2.824	.669	1.365	7.134
Other services activities (NACE S)	5.830	1.775	2.365	17.255
Foreign ownership	.012	.0186	0	.162
Credit Rating	294.746	17.092	255.189	378.589
Firm age	22.014	4.144	11.043	39.502
ln(sales)	15.222	.949	13.237	26.099

NOTES: Displayed are the mean values of the main variables with standard errors, min and maximum value.

Table A.4: Local Networks and New Business Formation (OLS Regression Results) using Founder Definition 2)

	(1) SE	(2) DN	(3) SE	(4) DN	(5) SE	(6) DN	(7) SE	(8) DN
Panel A								
Average degree (LBN)	25.15***	25.01***	25.26***	24.92***	25.28***	24.93***	6.732**	3.007
	(3.052)	(3.112)	(3.089)	(3.143)	(3.090)	(3.145)	(3.271)	(2.110)
Average degree^2 (LBN)	-6.308***	-6.376***	-6.339***	-6.354***	-6.342***	-6.356***	-1.651*	-0.672
	(0.820)	(0.835)	(0.830)	(0.844)	(0.830)	(0.844)	(0.860)	(0.560)
Constant	-20.96***	-17.99***	-21.06***	-17.91***	-21.08***	-17.92***	-4.031	1.932
	(2.715)	(2.768)	(2.749)	(2.796)	(2.749)	(2.798)	(2.982)	(1.923)
R-squared	0.356	0.368	0.363	0.375	0.363	0.375	0.845	0.953
Panel B								
Average degree (LON)	24.64***	23.73***	24.73***	23.59***	24.75***	23.60***	8.227**	3.378
	(3.801)	(3.809)	(3.838)	(3.838)	(3.840)	(3.840)	(3.264)	(2.116)
Average degree^2 (LON)	-6.353***	-6.211***	-6.377***	-6.175***	-6.380***	-6.177***	-2.162**	-0.803
	(1.048)	(1.046)	(1.056)	(1.052)	(1.056)	(1.052)	(0.895)	(0.578)
Constant	-19.66***	-16.05***	-19.74***	-15.93***	-19.76***	-15.95***	-4.974*	1.746
	(3.268)	(3.279)	(3.304)	(3.307)	(3.306)	(3.310)	(2.844)	(1.855)
R-squared	0.312	0.308	0.318	0.315	0.318	0.316	0.845	0.953
Panel C								
Average degree (LMN)	24.08***	23.41***	24.15***	23.34***	24.16***	23.35***	9.103***	3.991**
	(3.427)	(3.444)	(3.458)	(3.463)	(3.457)	(3.464)	(2.784)	(1.658)
Average degree^2 (LMN)	-6.046***	-5.967***	-6.064***	-5.952***	-6.066***	-5.952***	-2.191***	-0.950**
	(0.923)	(0.923)	(0.931)	(0.929)	(0.930)	(0.929)	(0.737)	(0.430)
Constant	-19.74***	-16.33***	-19.80***	-16.26***	-19.81***	-16.26***	-6.246**	1.131
	(3.019)	(3.039)	(3.048)	(3.055)	(3.048)	(3.057)	(2.525)	(1.531)
R-squared	0.332	0.334	0.338	0.341	0.338	0.342	0.845	0.953
Observations	4,883	4,883	4,883	4,883	4,883	4,883	4,883	4,883
DV Mean	4.234	5.228	4.234	5.228	4.234	5.228	4.234	5.228
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Regional Controls	NO	NO	YES	YES	YES	YES	YES	YES
Firm Structure Controls	NO	NO	NO	NO	YES	YES	YES	YES
LMR FE	NO	NO	NO	NO	NO	NO	YES	YES

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the natural logarithm plus one for de-novo (Ln(DN+1)) and serial entrepreneurship (ln(SE+1)) new business formation respectively. The founder is identified using time, managerial position and shareholder constraints (second definition).

Table A.5: Local Networks and New Business Formation (Poisson Regression Results)

VARIABLES	(1) SE	(2) DN	(3) SE	(4) DN	(5) SE	(6) DN
Average degree (LBN)	6.201***	1.884				
	(2.227)	(1.604)				
Average degree^2 (LBN)	-1.899***	-0.252				
	(0.625)	(0.456)				
Average degree (LON)			6.065***	2.639		
			(2.336)	(1.611)		
Average degree^2 (LON)			-1.957***	-0.503		
			(0.687)	(0.474)		
Average degree (LMN)					3.738**	2.566*
					(1.791)	(1.335)
Average degree^2 (LMN)					-1.194**	-0.473
					(0.492)	(0.378)
Observations	4,883	4,883	4,883	4,883	4,883	4,883
Number of amr	257	257	257	257	257	257
DV Mean	4.234	5.228	4.234	5.228	4.234	5.228
Year FE	YES	YES	YES	YES	YES	YES
Regional Controls	YES	YES	YES	YES	YES	YES
Firm Structure Controls	YES	YES	YES	YES	YES	YES
LMR FE	YES	YES	YES	YES	YES	YES

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the absolute count of serial and de-novo new business formation. The founder is identified using time constraints only (first definition).

Table A.6: Local Networks and New Business Formation (Poisson Regression Results) using Founder Definition 2

VARIABLES	(1) SE	(2) DN	(3) SE	(4) DN	(5) SE	(6) DN
Average degree (LBN)	8.102**	5.198**				
	(3.211)	(2.130)				
Average degree^2 (LBN)	-2.047**	-1.192**				
	(0.804)	(0.575)				
Average degree (LON)			9.035***	5.478**		
			(3.487)	(2.229)		
Average degree^2 (LON)			-2.444***	-1.350**		
			(0.914)	(0.627)		
Average degree (LMN)					9.333***	5.855***
					(2.849)	(1.855)
Average degree^2 (LMN)					-2.405***	-1.401***
					(0.706)	(0.516)
Observations	4,883	4,883	4,883	4,883	4,883	4,883
Number of amr	257	257	257	257	257	257
DV Mean	1.962	4.737	1.962	4.737	1.962	4.737
Year FE	YES	YES	YES	YES	YES	YES
Regional Controls	YES	YES	YES	YES	YES	YES
Firm Structure Controls	YES	YES	YES	YES	YES	YES
LMR FE	YES	YES	YES	YES	YES	YES

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the natural logarithm plus one for de-novo (Ln(DN+1)) and serial entrepreneurship (ln(SE+1)) new business formation respectively. The founder is identified using time, managerial position and shareholder constraints (second definition).

Table A.7: Distribution of New Businesses Across Legal Forms

	First Definition			Second Definition		
	De-Novo Entrepreneurship	Serial Entrepreneurship	Total	De-Novo Entrepreneurship	Serial Entrepreneurship	Total
Freelance *(Freie Berufe)*	6.05	1.89	4.65	8.70	5.27	8.45
Commercial enterprise *(Gewerbebetrieb)*	53.87	12.08	39.86	83.82	69.24	82.78
BGB-corporation *(BGB Gesellschaft)*	3.92	3.03	3.62	0.13	0.14	0.13
BGB-corporation – working group *(BGB Gesellschaft Arbeitsgemeinschaft)*	0.03	0.44	0.17	0.00	0.00	0.00
Sole proprietorship *(Einzelfirma)*	2.78	1.65	2.40	4.63	8.73	4.92
OHG	0.51	0.88	0.63	0.01	0.02	0.01
KG	0.61	1.41	0.88	0.02	0.16	0.03
GmbH & Co. KG	1.45	10.76	4.57	0.80	7.56	1.28
GmbH	28.70	65.31	40.97	1.87	8.79	2.36
AG	0.14	0.70	0.33	0.01	0.08	0.02
eG	0.07	0.14	0.09	0.00	0.00	0.00
eV	1.87	1.70	1.81	0.01	0.01	0.01
Company international	0.01	0.01	0.01	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00

Displayed is the percentage of business formation for different legal forms. Business formation here is either serial, de-novo or total business formation. The legal form displayed reflects the firs recorded legal form of a firm. For 451,968 no legal form is recorded and therefore coded as missing value. research to make up the group of de-novo entrepreneurs.

Table A.8: Local Networks and New Business Formation (Lewbel IV Regression Results) using Founder Definition 2

VARIABLES	(1) SE	(2) DN	(3) SE	(4) DN	(5) SE	(6) DN
Average degree (LBN)	2.536	1.658				
	(4.329)	(2.726)				
Average degree^2 (LBN)	-0.405	-0.250				
	(1.158)	(0.724)				
Average degree (LON)			2.292	0.860		
			(3.848)	(2.545)		
Average degree^2 (LON)			-0.418	-0.0292		
			(1.036)	(0.681)		
Average degree (LMN)					7.063**	2.724
					(3.133)	(2.147)
Average degree^2 (LMN)					-1.579**	-0.556
Observations	4,883	4,883	4,883	4,883	4,883	4,883
R-squared	0.438	0.693	0.438	0.693	0.441	0.694
DV Mean	1.962	4.737	1.962	4.737	1.962	4.737
Year FE	YES	YES	YES	YES	YES	YES
Regional Controls	YES	YES	YES	YES	YES	YES
Firm Structure Controls	YES	YES	YES	YES	YES	YES
LMR FE	YES	YES	YES	YES	YES	YES
Kleinberg-Paap LM	142.4	142.4	132.4	132.4	147.4	147.4
LM P-Val.	0.001	0.001	0.001	0.001	0.001	0.001
Hansen Chi-sq.	81.06	111.5	77.02	106.9	80.17	104.5
Hansen P-Val.	0.630	0.034	0.745	0.063	0.657	0.086

NOTES: Clustered standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. SE and DN captures the natural logarithm of (SE+1) and (DN+1) respectively. The founder is identified using time, managerial position and shareholder constraints (second definition).

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