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Local Entrepreneurship in Context

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AUDRETSCH D. B., FALCK O., FELDMAN M. P. and HEBLICH S. Local entrepreneurship in context, *Regional Studies*. This paper posits that regions provide locational factors which determine the industry structure and with it entrepreneurial opportunities whose exploitation influences regional dynamics. To test this interrelation between regional characteristics and entrepreneurial activities, seventy-four West German regions were classified by their endowments with locational factors. The local employees' group-specific propensity to start a business within the framework of count data models was then analysed. The empirical results suggest the distinct existence of entrepreneurial regional regimes, where local employees have a high propensity to start a business, and routinized regional regimes, with a lower propensity to generate local entrepreneurial activity.

Local entrepreneurship   Location factors   Count data models

AUDRETSCH D. B., FALCK O., FELDMAN M. P. and HEBLICH S. 在特定语境下的地方公司，区域研究。本文提出，区域提供的定位要素一方面决定了产业结构，另一方面其对于创业机会的挖掘也影响了区域活力。为了考察区域特征与公司活动之间的相互关联，我们将74个德国区域按其与地方要素之间关联进行分类。我们在计数数据模型框架内对地方就业群体的创业倾向进行了分析。实证结果表明，大量创业机构存在的区域地方就业人员开始创业的倾向较明显，而普通地区地方创业活动倾向较弱。

地方创业   地方要素   计数数据模型

AUDRETSCH D. B., FALCK O., FELDMAN M. P. et HEBLICH S. La relativisation de l'esprit d'entreprise local, *Regional Studies*. Cet article affirme que les régions fournissent des facteurs de localisation qui déterminent la structure industrielle et aussi des possibilités entrepreneuriales, dont l'exploitation influe sur la dynamique régionale. Afin de tester l'interrelation entre les caractéristiques régionales et les activités entrepreneuriales, on a classé soixante-quatorze zones situées dans l'ouest de l'Allemagne en fonction de leur dotation en facteurs de localisation. La propensité d'un groupe particulier de salariés locaux à lancer une affaire dans le cadre des modèles de données chiffrées se voit analyser. Les résultats empiriques laissent supposer la présence indéniable de régimes régionales entrepreneuriales où la propensité des salariés locaux à lancer une affaire s'avère élevée, et de régimes régionales systématisées dont la propensité à créer de l'activité entrepreneuriale locale s'avère moins élevée.

Esprit d'entreprise local   Facteurs de localisation   Modèles de données chiffrées

AUDRETSCH D. B., FALCK O., FELDMAN M. P. und HEBLICH S. Lokales Unternehmertum im Kontext, *Regional Studies*. In diesem Beitrag wird die These aufgestellt, dass Regionen Standortfaktoren bieten, die für die Branchenstruktur und damit auch die unternehmerischen Chancen maßgeblich sind, deren Nutzung sich auf die regionale Dynamik auswirkt. Um diese Wechselbeziehungen zwischen regionalen Merkmalen und unternehmerischen Aktivitäten zu untersuchen, wurden 74 westdeutsche Regionen hinsichtlich ihrer Ausstattung mit Standortfaktoren untersucht. Anschließend wurde im Rahmen von Zähldatenmodellen die gruppenspezifische Neigung der lokalen Arbeitnehmer zur Gründung von Firmen analysiert. Die empirischen Ergebnisse legen den Schluss nahe, dass unternehmerische Regionalregime, in denen die lokalen Arbeitnehmer eine hohe Neigung zur Firmengründung aufweisen, und routinierte Regionalregime mit einer geringeren Neigung zu lokaler unternehmerischer Tätigkeit getrennt voneinander existieren.

Lokales Unternehmertum   Standortfaktoren   Zähldatenmodelle

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Audretsch D. B., Falck O., Feldman M. P. y Heblich S. El empresariado local en contexto, *Regional Studies*. En este artículo proponemos que las regiones ofrecen factores de ubicación que determinan la estructura de la industria y a la vez oportunidades empresariales cuya explotación influye en las dinámicas regionales. Para comprobar la interrelación entre las características regionales y las actividades empresariales se analizaron las dotaciones con factores de ubicación de setenta y cuatro regiones de Alemania del Oeste. Luego analizamos la predisposición de grupos específicos de empleados locales para empezar un negocio en el marco de los modelos de datos de recuento. Los resultados empíricos indican que existen, por separado, regímenes regionales empresariales donde los empleados locales tienen una alta predisposición a empezar un negocio y regímenes regionales transformados en rutina con una predisposición menor a generar actividad empresarial local.

Empresariado local Factores de ubicación Modelos de datos de recuento

JEL classifications: O18, O31, R12

INTRODUCTION

Economic development certainly has a spatial dimension that leaves its mark on places. For instance, the current transition to a knowledge-based society eventually contributes to what Duranton and Puga (2005) call a functional specialization between regions that attract the invention and creation of products, on the one hand, and pure production, on the other hand. Innovation takes place in regions rich with knowledge-based location factors (Audretsch and Feldman, 1996). In contrast, production takes place in regions tailored to the demand of industrial production – relatively low-cost industry parks and low wages, along with a specialized pool of qualified but not necessarily highly qualified workers. As a result, this differential specialization has been characterized as different regional growth regimes (Audretsch and Fritsch, 2002). It is expected that the propensity to engage in entrepreneurial activity will be a function of these endowments.

The fortunes of regions and entrepreneurs are intertwined: regional endowments provide opportunity and resources for entrepreneurs, while entrepreneurs simultaneously shape the local environment (Feldman, 2001). To take a closer look at regional differences and how they are reflected by entrepreneurial activities as a driving force underlying regional innovation and growth, it is appropriate to switch the unit of analysis to the aggregated regional level. Here, slow and gradual changes in the characteristics of regions should influence the extent of local entrepreneurship either by entry in general or by experienced entry. The aim of this paper is to explore differences in the propensity to start a business across seventy-four West German planning regions. Local incumbents' employees in general are distinguished from local employees with intra-industry experience as potential entrepreneurs. To do so, a stepwise econometric procedure is applied. Initially, regions are clustered according to their infrastructure, industrial specialization, and economic diversity, and five distinct regional groups are identified. A count data model with the number of local start-ups as a dependent variable is then applied to estimate the local employees' propensity to start a business for each regional category. Finally, the share of employees with intra-industry experience is considered, and their propensity to start a business is estimated.

When applying this procedure, regions are found with a high propensity to start a business which is characterized here as an *entrepreneurial regional regime*. By contrast, those regions with lower propensities to start a business are characterized as a *routinized regional regime*. With regard to the experienced local employees' propensity to start a business, only one regional group differs significantly from the others. This group can be best described as an *industrial agglomeration*.

The remainder of the paper is organized as follows. The second section discusses the interrelation between the characteristics of regions and local entrepreneurial activities in more detail. The data and methodology are presented in the third section; and the results in the fourth section. The fifth section concludes with a discussion of the results and implications for further research.

THE CHARACTERISTICS OF REGIONS AND ENTREPRENEURSHIP

Region-specific location factors should be related to the region's innovative capacities and hence determine regional growth regimes (cf. Audretsch and Fritsch, 2002; Falck and Heblich, 2008; Glaeser and Kerr, 2009). This link emanates from Marshall's (1920) initial conclusion that external economies of scale arise on a regional level. These external economies can fall into two major groups: pecuniary externalities and knowledge externalities (cf. Ellison and Gleaser, 1997; Krugman, 1991). Pecuniary externalities result from natural advantages in the form of resource endowment, advantageous locations, or comparatively low labour costs (Ellison and Gleaser, 1999). Given that natural advantages are often especially supportive of one or a few industries' production, they are more likely to drive the concentration of common firms and maybe their suppliers.

By contrast, knowledge externalities are not necessarily related to the existence of natural resources, but to an environment that attracts smart people whose interactions, knowledge exchange, and prior experience subsequently contribute to the regional knowledge stock. Technically, this stock of knowledge is assumed to be a non-rival input so that everyone engaged in research and development has free access to the entire stock of knowledge at the same time. However, as initially pointed out by JAFFE *et al.* (1993), regionally developed knowledge – in their case embodied in publicly accessible patents – is most likely to boost the accumulation of further knowledge within the same region. Similar evidence is found for the spatial distribution of innovative activity by FELDMAN (1994), who argues that the cost of innovation is lower in geographic agglomerations, which leads to more productive resources. An explanation for the distance decay in productivity of knowledge is that tacit knowledge is embodied in people and hence stuck to the region (AUDRETSCH and FELDMAN, 1996).

The unequal distribution of externalities leading to different regional advantages has given rise to the new field of economic geography. The field of urban economics analyses the comparative advantages of urban areas in the production of new knowledge (HENDERSON, 2005). Others concentrate on the production of goods and present explanations for the emergence and persistence of agglomerations around large manufacturing firms (MARKUSEN, 1996) or the special case of industrial districts, that is, local networks of small firms (BECATTINI, 1990; PIORE and SABEL, 1984). The key finding of this research is that comparative advantages differ across regions, thereby leading to a spatial division of production. As described by DURANTON and PUGA (2001), the formative, innovative stages are more likely to locate in regions with diverse economies and corresponding spillovers, both of which are conducive to the creation of a new product. However, once the innovation has taken place and a product line or process is introduced, the actual production is moved to more specialized localizations.

A further understanding for the mechanism underlying the separation between innovation and production results from DURANTON and PUGA (2005). Here, firms choose to split their internal organization as long as the additional costs from coordinating and managing multiple locations do not exceed the benefits from exploiting different regions' locational advantages; otherwise, firms remain integrated. As outlined by AUDRETSCH *et al.* (2009), it is especially smaller firms that do not have the size to benefit from an organizational separation and thus remain integrated. Ideally, these firms locate between innovation and production locations in order to benefit from proximity while incurring lower wage and rent. Accordingly, these regional characteristics act as region-specific location factors that determine dynamics and growth, and eventually define regional innovation regimes.

Against this background, it is worth looking at entrepreneurship for two reasons. First, entrepreneurship is regarded as an important source of dynamics. Second – and probably more important in the present context – entrepreneurship is regarded as a regional event (FELDMAN, 2001; STAM, 2007) where the entrepreneurial opportunities arise from the surrounding regional environment. Entrepreneurs are likely to be either life-long residents of the region or to have lived and worked there for at least several years (GREENE *et al.*, 2008; KEEBLE and WALKER, 1994; SAXENIAN, 1999). Past experience and frequent social interactions eventually create a dense social network that provides access to information and also facilitates the process of resource generation (STUART and SORENSON, 2005; MICHELACCI and SILVA, 2007).

To test the interrelation between the characteristics of regions and their impact on entrepreneurial activities, a stepwise econometric procedure for seventy-four West German regions is applied. Initially, regions are classified based on their provision of location factors. Based on that, entrepreneurial activities in these different types of regions are analysed, which eventual leaves entrepreneurial regional regimes and routinized regional regimes.

ENTREPRENEURSHIP IN CONTEXT

The characteristics of regions

To enable inferences on the importance of local entrepreneurship across regions, data on seventy-four West German planning regions (excluding Berlin) are used.[1] These regions are characterized according to their infrastructure, industrial specialization, and economic diversity. Assumedly, the regional industry structure changes only gradually over time – *natura non facit saltum* (nature does not make jumps)[2] – because production is related to sunk investment which eventually leads to persistence and path dependency. This statement seems especially plausible for manufacturing industries and the authors are thus not worried about reverse causality issues, in the sense that local entrepreneurship itself could influence the regional industry structure in the relatively short amount of time analysed in this paper (1987–2000).

The first category describes the quality of the available infrastructure in the region, using indicators provided by the Office for Building and Regional Planning to characterize the quality of the available infrastructure (cf. MARETZKE, 2005): the accessibility of the nearest three national or international agglomerations via road and rail combined; the accessibility of

European metropolises via road and air combined; and the availability of modern transportation systems.

These infrastructure indicators are modern in that they are not suitable for the transportation of heavy input factors such as coal or steel, which were crucial in the age of industrialization. However, today's knowledge-based society requires transportation facilities that link residents of a region to other regions, especially cities, and therefore facilitate the exchange and the inflow of fresh knowledge. In the past, proximity to a seaport was literally a gateway to the world with all that implies for economic development and growth (ACEMOGLU *et al.*, 2005); today, that role is more usually filled by an airport. The infrastructure indicators reflect accessibility in this latter conceptualization.

The second category reflects the degree of regional specialization. All indicators are based on regional employment data derived from the German Social Insurance Statistics (for a description of this data source, see FRITSCH and BRIXY, 2004). The Social Insurance Statistics requires every employer to provide certain information (for example, qualifications) about every employee subject to obligatory social insurance. The ratio of employees in manufacturing to all employees subject to social security in the region describes the industry mix in the region. Based on this, the Herfindahl index – which is the sum of the squares of the employment shares of each industry in manufacturing – is calculated as an indicator for the concentration of manufacturing industries. Finally, a variable that combines firm size with research and development activities – which is calculated as the share of employees with a degree in engineering or natural science in small businesses relative to the total number of employees with a degree in engineering or natural sciences – reflects the relative role of large firms in regional research and development. A small value signifies the predominance of large firms in regional research and development while a large number indicates the importance of small firms in regional research and development.

The third group of variables reflects the extent of regional diversity. Bohemians, along with jack-of-all-trades small business employees, are characteristic of the diversity of the regional labour market. Furthermore, the share of employees in business services, the share of patents applied for by residents, and the share of patents applied for by local research institutions are indicators of diversity in regional knowledge stock. To measure this, patent data are taken from the *German Patent Atlas* (GREIF and SCHMIEDL, 2002). This provides information on the number of patents applied for in a planning region and distinguishes between three groups of applicants: businesses, universities and research institutions and natural persons (cf. GREIF and SCHMIEDL, 2002). Table 1 summarizes all three groups of variables.

To determine whether this large number of indicators can reveal commonalities across the three dimensions – infrastructure, specialization, and diversity – the authors start with a principal factor analysis (cf. FABRIGAR *et al.*, 1999) of all the regional variables (cf. Table 1). All variables were standardized by calculating the mean and dividing by the standard deviation. The Kayser criterion

Table 1. Regional variables entering the factor analysis

Variable	Description and source	Categorization
Infrastructure 1	Accessibility of the nearest three national or international agglomerations via road and rail combined (minutes), 2004. Federal Office for Building and Regional Planning	Infrastructure
Infrastructure 2	Accessibility of a European metropolis via road and air combined (minutes), 2004. Federal Office for Building and Regional Planning	
Infrastructure 3	Availability of a modern transportation system (accessibility; minutes), 2004. Federal Office for Building and Regional Planning	
Share of employees in manufacturing	Share of employees in manufacturing compared with the total number of employees subject to social security; average over the time span 1987–2000. Social Insurance Statistics	Specialization
Herfindahl index in manufacturing	Sum of squares of the employment shares of each industry in manufacturing; average over the time span 1987–2000. Social Insurance Statistics	
R&D and business size	Share of employees with a degree in engineering or natural science in a small businesses compared with the total number of employees with a degree in engineering or natural science; average over the time span 1987–2000. Social Insurance Statistics	
Share of small business employment	Share of small business employment (businesses with at most fifty employees); average over the time span 1987–2000. Social Insurance Statistics	Diversity
Share of employees in business-related services	Share of employees in business services compared with the total number of employees subject to social security; average over the time span 1987–2000. Social Insurance Statistics	
Share of bohemians	Share of publicists, musicians, actors, painters, and designers compared with the total number of employees subject to social security; average over the time span 1987–2000. Social Insurance Statistics	
Share of patents applied for by natural persons	Share of patents applied for by natural persons; average over the time span 1995–2000. *German Patent Atlas*	
Share of patents applied for by research institutions	Share of patents applied for by universities and research institutions; average over the time span 1995–2000. *German Patent Atlas*	

Note: R&D, research and development.

(CATTEL, 1966) and the scree test on the eigenvalues of the factors suggest retaining two factors with eigenvalues greater than 1. In the eigenvalue graph (not shown) there is a breakpoint after the second factor where the curve flattens out. To clarify the data structure, orthogonal rotation was used on the remaining factors. It turns out that all variables in the Diversity category (cf. Table 1) have important cross-loadings. COSTELLO and OSBORNE (2005) argue that cross-loading indicators should be dropped from the analysis. As a result, these variables were dropped and the factor analysis was rerun. Note that dropping some of the variables is meaningful in itself. For example, the cross-loading of the variable *share of bohemians* may be due in part to Germany's historical past; its system of mini-states created a high density of cultural facilities such as theatres. The results of this practice mean that the cultural facilities that attract bohemians are rather evenly distributed across the entire country, that is, there is not much regional variation in this respect. For a similar reason, the variable *business services*, which contains the banking sector, is dropped. The German banking system consists of private, mutual, and public banks that guarantee a more or less even distribution of banks across all regions. Accordingly, this variable does not exhibit much variation either. After dropping these variables, two factors were retained that are orthogonally rotated to get a clearer structure. The results of this second factor analysis are displayed in Table 2.

The first factor is highly and positively correlated with the three infrastructure variables. It is therefore regarded as an indicator of the quality of the region's infrastructure. The second factor reflects agglomeration economics. This factor is positively correlated with the share of employees in manufacturing and with the Herfindahl index; however, it is negatively correlated with the variable combining firm size with research and development activities.

Table 2. Results of the factor analysis

Variable	Factor 1	Factor 2
Infrastructure 1	0.76	0.01
Infrastructure 2	0.81	−0.10
Infrastructure 3	0.82	0.11
Share of employees in manufacturing	0.15	0.40
Herfindahl index in manufacturing	0.01	0.53
R&D and business size	0.01	−0.68
Eigenvalue	2.03	1.00
Eigenvalue of following factor	1.00	0.27

Notes: Factor loadings displayed were derived as a result of a factor analysis for West German planning regions based on the variables as described in Table 1. All variables were standardized by calculating the mean and dividing by the standard deviation (SD). The Kayser criterion and the scree test on the eigenvalues of the factors suggest retaining two factors with eigenvalues greater than 1. The eigenvalue graph has a breakpoint after the second factor where the curve flattens out. The results displayed are after the elimination of variables with important cross-loadings and after orthogonal rotation.

R&D, research and development.

Groups of regions

Based on these two factors, West German planning regions are grouped by means of a hierarchical Ward's linkage cluster analysis (WARD, 1963). Table 3 provides descriptive statistics of the two factors by group. It reveals that Group 1 does not have an extreme value in either Factor 1 or Factor 2. Group 2 is characterized by the highest value of Factor 1, indicating the worst accessibility value, whereas Group 4 has the lowest value of Factor 1 and thus the best accessibility. Finally, Group 3 has the highest value of Factor 2, indicating an exceedingly high degree of agglomeration, while Group 5 has the lowest value of Factor 2 and thus is least agglomerated.

Table 4 shows the results of pairwise tests on the equality of means across the five groups. This procedure helps to order the five groups with respect to the values of Factor 1 and Factor 2. Regarding Factor 1, it is already known that Group 2 and Group 4 mark the upper and lower borders, respectively. Furthermore, there is no significant difference between Group 1 and Group 3 nor between Group 3 and Group 5. This suggests that all three groups have a fair accessibility: Group 1's accessibility is the worst among the three and Group 5's is the best of the three. Regarding Factor 2, Group 3 and Group 5 mark the upper and lower borders, respectively. In between, there is no significant difference between Group 1 and Group 4 nor between Group 2 and Group 4. Accordingly, Group 1 tends to be relatively more agglomerated while Group 2 tends to be somewhat less agglomerated.

Fig. 1 presents the corresponding dendrogram for the cluster analysis, where five different groups of regions labelled as follows are identified:

- Group 1 – *Industrial Districts*. This group's accessibility values indicate that its members are located in rather rural areas and, as the map (cf. Fig. 2) suggests, often near industrial agglomerations. Their tendency toward agglomeration further indicates a rather specialized spatial pattern of production. The industrial districts of this group evolve over time, becoming

Table 3. Descriptive statistics

Group	Number of planning regions	Factor 1		Factor 2	
		Mean	SD	Mean	SD
1	19	0.39	0.25	0.21	0.33
2	12	1.36	0.39	−0.19	0.47
3	6	0.07	0.72	1.75	0.41
4	18	−1.19	0.28	−0.01	0.57
5	19	−0.14	0.32	−0.63	0.42
Overall	74	0.00	0.91	0.00	0.75

Notes: Descriptive statistics are displayed for the predicted values of the two factors resulting from a factor analysis for West German planning regions (cf. Table 2). Group 1 refers to industrial district; group 2 refers to periphery; group 3 refers to industrial agglomeration; group 4 refers to urban agglomeration; and group 5 refers to urban periphery.

SD, standard deviation.

Table 4. Test for equality of the mean

	Group 1	Group 2	Group 3	Group 4	Group 5
Group 1		−8.43***	1.69	17.80***	5.74***
		2.83***	−9.25***	1.50	6.78***
Group 2			5.00***	20.66***	11.69***
			−8.50***	−0.90	2.63**
Group 3				6.29***	1.06
				6.89***	11.93***
Group 4					−10.33***
					3.69***
Group 5					
Factor 1: Equality of all means	*F*-statistic: 101.61***				
Factor 2: Equality of all means	*F*-statistic: 32.88***				

Notes: Results of the *t*-test for the pairwise equality of means of the two factors as described in Table 2 across groups of regions are displayed. The first figure refers to factor 1; the second figure refers to factor 2. The last rows display the results of the *F*-test of the equality of means over all five groups. Group 1 refers to industrial district; group 2 refers to periphery; group 3 refers to industrial agglomeration; group 4 refers to urban agglomeration; and group 5 refers to urban periphery.

***Significance at the 1% level; and **significance at the 5% level.

home to smaller manufacturers along the supply chain of large companies in industrial agglomerations. Included in this group is the well-known industrial district of metal producers south of Stuttgart.

- Group 2 – *Periphery*. The regions in this group have the worst accessibility scores and a rather diverse industry structure. This group has either already experienced structural change or is in the process of it. One example of a region that belongs to this group is the area around Hof (Upper Franconia), previously one of Europe's major textile industry locations, but now large parts of this industry have moved to low-wage countries and left a large structural gap of unemployment.
- Group 3 – *Industrial Agglomeration*. This group has the highest industry concentration and fair accessibility values. Included in this group are production facilities such as the one for BASF in Ludwigshafen, Volkswagen in Wolfsburg, and Audi in Ingolstadt.
- Group 4 – *Urban Agglomeration*. This group is characterized by the highest accessibility and an average degree of agglomeration. As illustrated in Fig. 2, urban agglomerations include metropolises such as Munich, Frankfurt, Cologne, and Hamburg.

Fig. 1. Dendrogram

Note: The dendrogram of a hierarchical Ward's linkage cluster analysis is shown for West German planning regions. The cluster analysis is based on the factors as described in Table 2

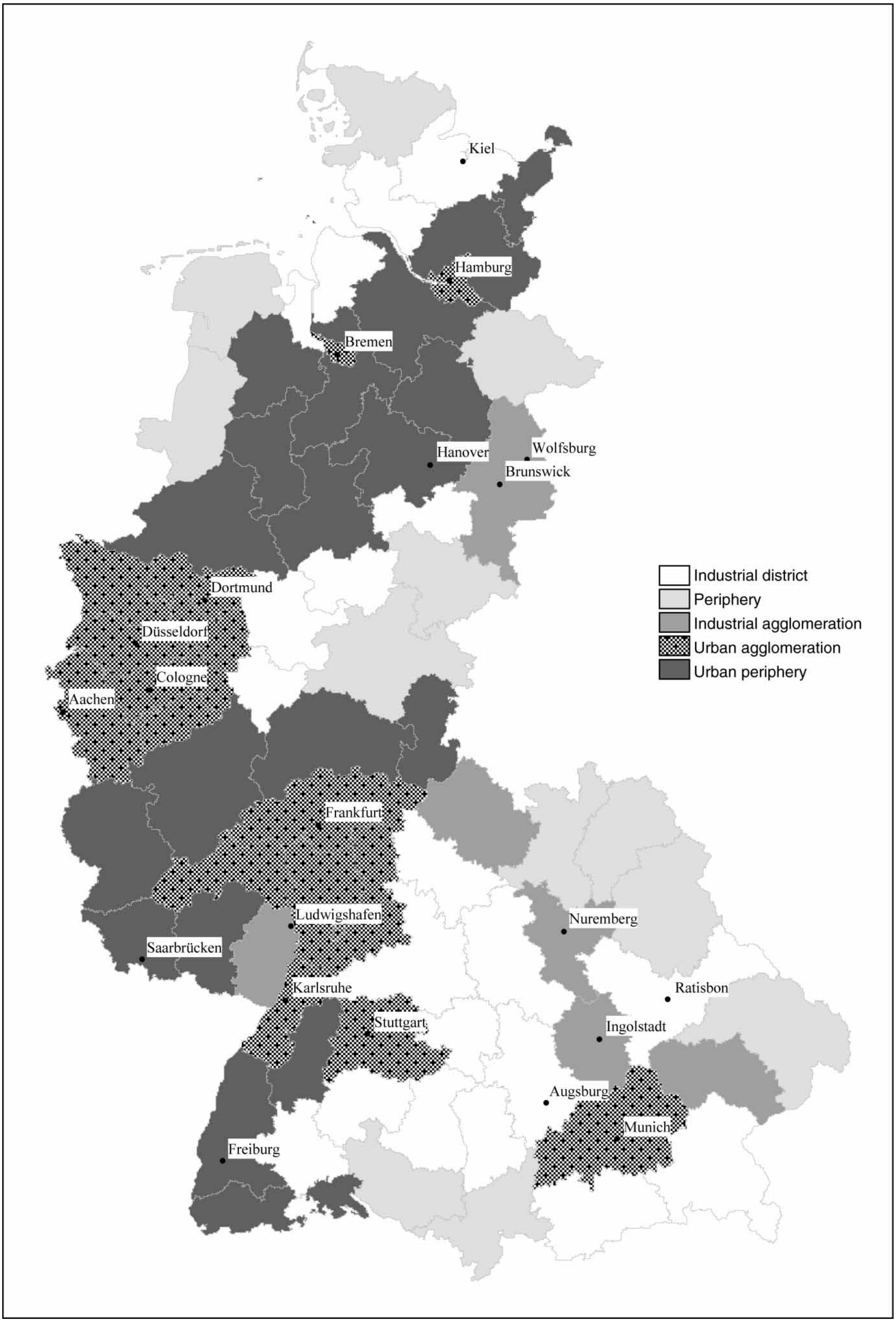

Fig. 2. Regional Groups in West Germany

- Group 5 – *Urban Periphery.* This group is quite similar to Group 1. However, it is has slightly better accessibility and less industry agglomeration. In contrast to Group 1, Group 5 benefits more from the metropolis's infrastructure than from its industry structure. Group 5 regions offer centrality and nature-oriented living conditions at a reasonable price and thus should be especially attractive to medium-sized companies of various industries.

The characteristics of regions and entrepreneurial activities

An *establishment file* from German Social Insurance Statistics provides longitudinal information about regional establishments and their employees. The unit of measurement is the establishment, not the company. The data include two categories of entities: firm headquarters and subsidiaries. Each establishment with at least one employee has a permanent individual code number, allowing start-ups and closures to be identified.[3] The entry data consist of the number of entries in twenty-three manufacturing industries in seventy-four West German planning regions over time (1987–2000).

The concern of this paper is on endogenous regional dynamics, therefore focus is made on new firms founded by employees who have previously worked in the region's incumbent firms. The potential pool of founders in a certain year t in planning region r and industry i is, therefore, the number of employees in region r in $t-1$. The authors are interested in estimating whether the propensity to start a business varies across the five regional groups. Therefore, the following count-data Poisson model with group (by region) robust standard errors is estimated:

$$\log(E(Entry_{irt})) = \alpha_s + \alpha_i + \beta_{1i} time + \beta_{2i} time^2 + \beta_{3i} time^3 + \delta_s empl_{rt-1} + \varepsilon_{irt}$$

where $E(Entry_{irt})$ is the expected number of new establishments in manufacturing industry i in region r in year t;[4] α_s is fixed-effects for the five regional groups; and α_i is industry-specific fixed-effects. The fixed-effects capture all differences in levels of new establishments across industries and groups of regions. Furthermore, one controls for industry-specific dynamics, that is, business cycles and technological trends, over time by adding $time$, $time^2$, and $time^3$. Note that β_1 to β_3 are industry-specific; ε_{irt} is an error term; and δ_s is the coefficients of interest. For each group of regions, they give the specific propensity to start a business of local employees *empl* in year $t-1$. Of course, the general level of the coefficient δ might still be hampered by a large number of omitted variables at the regional level. However, the authors are not interested in the absolute level of δ, but in the differences between the group of region-specific coefficients δ_s. The differences in the coefficients can plausibly be ascribed to the observed differences across the five groups of regions that resulted from the cluster analysis.

Since regions are not uniform in size, it is common practice to analyse start-up rates by relating the number of start-ups to an indicator for the size of the region, for example, the number of employees, the number of businesses (cf. AUDRETSCH and FRITSCH, 1994), or the population. However, using start-up rates instead of counts does not allow one to estimate δ, which reflects the propensity to start a business by local employees. Furthermore, simply adding an indicator for the size of the region to the right-hand side of a count data model is qualitatively the same as using start-up rates on the left-hand side (cf. FRITSCH and FALCK, 2007).

In a further step, the share of employees *s_empl* in the respective industry i in region r at time $t-1$ was added to the model:

$$\log(E(Entry_{irt})) = \alpha_s + \alpha_i + \beta_{1i} time + \beta_{2i} time^2 + \beta_{3i} time^3 + \delta_s empl_{rt-1} + \varphi_s s\_empl_{irt-1} + \varepsilon_{irt}$$

The group of region-specific coefficients φ_s can be interpreted as the influence of industry experience on the propensity to start a business, conditional on the number of employees in the region in year $t-1$. By concentrating on intra-industry experience, this measure resembles KLEPPER's (2007) idea of intra-industry spin-offs in the broader sense. However, as the analysis is at the aggregate regional level, one cannot directly link spin-offs to parents, but only present statistical relations that can be explained by Klepper's extensive firm-level analysis. Again, the authors are only interested in the differences between the coefficients φ_s and not in the general level in φ.

RESULTS

Table 5 displays the results of a simple Poisson count data model with cluster (planning region) robust standard errors. The second column of Table 5 shows the average propensity of all local incumbents' employees to start a business in a selected manufacturing industry. The data clearly reflect that the local employees' propensity to start a business is lowest in the periphery (Group 2) and the industrial agglomerations (Group 3). Periphery (Group 2) and the industrial agglomerations (Group 3) are thus categorized as being *routinized regional regimes*, that is, innovations are likely to be introduced by incumbent firms in these regions. The propensity to start a business by local employees is highest in industrial districts (Group 1), urban agglomerations (Group 4), and the urban periphery (Group 5). Industrial districts (Group 1), urban agglomerations (Group 4), and the urban periphery (Group 5) are thus categorized as

Table 5. Results of the Poisson model

	Propensity to start a business	Agglomeration economies
Group 1		
Number of employees in the respective planning region (log, lagged one year)	0.9068***	0.8905***
	(9.47)	(8.98)
Share of employees with industry experience (lagged one year)		0.1067***
		(6.31)
Group 2		
Number of employees in the respective planning region (log, lagged one year)	0.7187***	0.6342***
	(13.24)	(9.27)
Share of employees with industry experience (lagged one year)		0.0877**
		(5.79)
Group 3		
Number of employees in the respective planning region (log, lagged one year)	0.7143***	0.7334***
	(12.61)	(14.53)
Share of employees with industry experience (lagged one year)		0.0256**
		(6.43)
Group 4		
Number of employees in the respective planning region (log, lagged one year)	0.8934***	0.8934***
	(14.51)	(14.30)
Share of employees with industry experience (lagged one year)		0.0793**
		(3.65)
Group 5		
Number of employees in the respective planning region (log, lagged one year)	0.9385***	0.9005***
	(13.84)	(17.22)
Share of employees with industry experience (lagged one year)		0.1126**
		(6.94)
Statistics		
Equality of the added coefficients over the five clusters (Chi-squared; χ^2)	12.17**	53.32***
Number of observations	33670	33670
Log pseudo-likelihood	−66 380.40	−64 229.09

Notes: Results are shown of Poisson regions with the number of start-ups (thirty-five manufacturing industries × seventy-four planning regions × fourteen years) as the dependent variable. All regressions include (but are not displayed in the table) five group dummies, industry dummies, and industry-specific time paths (time, time^2, and time^3) as controls. Group 1 refers to industrial district; group 2 refers to periphery; group 3 refers to industrial agglomeration; group 4 refers to urban agglomeration; and group 5 refers to urban periphery.

Cluster (planning region) robust z-values are shown in parentheses.

***Significance at the 1% level; and **significance at the 5% level.

being an entrepreneurial regional regime, that is, innovations are likely to be introduced by start-ups in these regions. Pairwise Chi-squared (χ^2) tests of the equality of coefficients actually confirm the fact that the δ_s of Groups 1, 4, and 5 are not significantly different from each other, while being significantly different from the δ_s of Groups 2 and 3. The δ_s of Groups 2 and 3 do not significantly differ from each other.

The third column of Table 5 includes the one-year lagged share of employees with experience in a respective manufacturing industry. Again, the empirical results show a clear pattern: industrial districts (Group 1), urban agglomerations (Group 4), and urban peripheries (Group 5) are most likely to engage in entrepreneurship, while peripheries (Group 2) and industrial agglomerations (Group 3) are the least likely to be entrepreneurial. φ_s as a measure for the importance of industry experience is outstanding in Group 3 (Industrial Agglomerations). Again, pairwise χ^2-tests of the equality of the coefficients confirm that the Group 3 coefficient is significantly lower than all other group coefficients. The φ_s of Groups 1, 2, 4, and 5 do not significantly differ from each other.

For robustness checks, a negative binomial model that allocates a higher density to the tails of the distribution was estimated. Furthermore, zero-inflated models were estimated to account for the fact that zero as an outcome is driven by forces other than the non-zero outcomes. In the inflation model, the number of employees in the respective region and manufacturing industry at the starting point $t = 0$ (1987) is entered as an explanatory variable. Here, the number of employees in a certain industry and region at $t = 0$ is an indicator of whether industry i existed in region r at the beginning of the period of analyses. The rationale is that there might be further barriers to entry – for example, the absence of natural advantages (Ellison and Gleaser 1997) – in the situation where an industry did not exist at all in a specific region. In all of these specifications, the results are very similar to the basic Poisson model. They are available from the authors upon request.

DISCUSSION AND CONCLUSIONS

The results suggest that the distribution of location factors across regions leads to a specialization of production in different regional regimes. These regional regimes' performance eventually depends on their ability to adjust to environmental changes through innovation. Considering entrepreneurial activities to be the driving force behind innovation, a closer look was taken at regional differences and how they are reflected in the propensity to start a business across regions. Entrepreneurial regional regimes where the local employees exhibit a high propensity to start a business and routinized regional regimes where the propensity to start a businesses is comparatively low are found. When considering employees with intra-industry experience and estimating their propensity to start a business, one group is found among the routinized regional regime whose employees with industry experiences exhibit a significantly lower propensity to start a business. Given their endowment with location factors, these regions have been labelled 'industrial agglomerations'.

Industrial agglomerations are dominated by one industry and thus are rather specialized. Therefore, MARKUSEN (1996) relates their industrial organization to a 'hub-and-spoke' structure where one or a number of key firms act as the hub and smaller firms circle around the hub like spokes. In this set-up, incumbent firms are likely to focus on routinized innovation, which leaves little space for

> the unrestricted exercise of imagination and boldness that is the essence of entrepreneurship. It is rather the domain of memoranda, rigid cost controls, and standardized procedures, which are the hallmark of trained management.
> (BAUMOL, 2002, p. 36)

Following KLEPPER and THOMPSON (2006), this atmosphere provides incentives for employees working for incumbents to start their own venture, a spin-off, when they disagree with management decisions on which projects should be pursued. However, starting a new business in an industrial agglomeration comes with some burdens, primarily comparatively high costs. Along this line, MARKUSEN (1996) argues that workers' loyalties are to the core firms first, then to the district and only after that to small firms. 'If jobs open up in hub firms, workers will often abandon smaller employers to get onto the hub firm's payroll' (p. 303). Poaching employees from incumbents is thus rather costly and the cost of land in areas already characterized by large industry parks is also comparatively high.

The empirical identification strategy is based on the fact that regional regimes only change gradually – *natura non facit saltum*. This fact allows one to identify a plausibly causal effect of regional regimes on local entrepreneurship in the short and middle run. However, in the long run, local entrepreneurship will also shape regional regimes, that is, causality goes in the opposite direction. Having a longer time series would enable the short/middle and long runs to be considered simultaneously, which is challenging in identifying causal effects.

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NOTES

1. Planning regions are categorized based on commuter distances. They consist of several districts and include at least one core city and its surrounds.
2. MARSHALL (1920) adopted this motto for his *Principles of Economics*.
3. The appearance of a new code number is interpreted as a start-up, and the disappearance of a code number is interpreted as a closure. New businesses with more than twenty employees in the first year of their existence are excluded. As a result, a considerable number of new subsidiaries of large firms contained in the database are not counted as start-ups because the foundation of new subsidiaries of large firms is likely to follow different rules than entrepreneurial start-ups. However, the share of new establishments in the data with more than twenty employees in the first year is rather small (about 2.5%). Ignoring size limits does not lead to any significant change in the results.
4. In a further specification, net entry is used instead of gross entry, that is, the number of establishment closures has been deducted from the number of new firms. It turned out that the results are qualitatively the same, whereby the differences in the levels of net versus gross entry are captured in the model's fixed-effects. The results on the basis of net entry are available from the authors upon request.

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