The determinants of regional differences in new firm formation in West-Germany

Udo Brixy* and Michael Niese**

* Institute for Employment Research, Nuremberg, e-mail: udo.brixy@iab.de
** e-mail: michael.niese@web.de

Paper prepared for presentation on the 43rd Congress of the European Regional Studies Association (ERSA) 27-31 August 2003 at the University of Jyväskylä (Finland)

0   Abstract:

Differences in the spatial patters of the intensity of new firm formation have attracted the interest of researchers for a long time. Usually birth-rates or sometimes count-data are used to explain the spatial pattern with the help of a variety of independent variables. Starting from a Shift-Share-analysis we examine the regional shares of the number of newly founded firms in 74 West-German planning regions between 1987 and 1997. The regional shares have the advantage that effects of different regional industry-structures as well as different size-structures are excluded. Therefore, by analysing the regional share, the factors determine the number of newly founded firms – apart from industry-structure and regional size – can be examined very clearly.

There are four main results of our estimations. First urbanisation-effects are of great importance for the number of newly founded firms. Regions with a high density of population provide a prosperous environment for entrepreneurs. Furthermore, urbanisation-effects affect the correlation between the regional share and other regional characteristics, too. Usually a high share of employees working in SMEs and especially a high proportion of R&D in SME are rated as signs for the existence of a "seed-bed" for entrepreneurs. But in our analysis these variables show a negative influence on the number of newly founded firms. As the values of these indicators are higher in rural and peripheral located regions, our conclusion is that this is because of the missing urbanisation-effects.

Secondly, there is a tendency that the properties that are favourable for starting new businesses are less favourable for the survival of newly founded firms. We are the opinion that this is at least partially the result of a high degree of competition between newly founded firms.

Thirdly, high rates of unemployment result in a high number of newly founded firms. Because of missing alternatives on the labour market, people tend to start their own businesses more easily than in regions with a lesser degree of unemployment.

Fourthly, we found a high degree of spatial autocorrelation. "Neighbouring regions have much in common" that result in similar values of the regional share. But it could be shown that this is not due to common factors that are missing in our analysis.

1   Introduction

The variation of the differences in regional new firm formation have attracted the interest of researchers since the 1980s (Arminton / Acs 2002). Usually regressions are calculated to explain the variation of new firm formation rates or sometimes count data models are used. But the influence of the regional industry mix on the amount of newly founded business is well known (Fritsch / Niese 2003). The standard approach for dealing with the spatial influence of different regional industry structures is the Shift-Share-Analysis. Therefore we calculated in a first step a Shift-Share-Analysis. This yields three shares. The national or total share, the industry mix share and the regional or local share. The latter describes the extent to which factors unique to the region have caused growth or decline in the regional performance.

As a residual the regional share contains the number of newly founded firms in a region that is not influenced from its size and industry-structure.

The outcome of the Shift-Share-Analysis is however, that the influence of the industry structure is not as big as one might have expected. The influence of the industry structure share is just 2.9% and the one of the regional share is 7.6. So combined they account for only 10.5%. This means that nearly 90% of all regional differences can be explained by the national standard and just arise from the differences in regional size.

Nevertheless the regional variation is quite big. The regional share varies between -20.7% and 12.1%, the structural share between -9.4% and 8.1%. To examine the factors that influence the birth of new business apart from industry-structure and regional size, we use the regional share as a dependent variable in regression models. Hence it is possible to estimate models with independent variables that should explain differences in regional entry apart from industry and size. Its value can be negative or positive. In the first case it means that there are fewer firms founded than expected and vice versa. The analysis is restricted to West-Germany during a ten-years period from 1987 until 1997[1].

2 Factors that might influence the value of the regional share

Factors with a possible influence on the regional share are manifold. Usually they are categorised into three classes. First, indicators for the level of the regional demand. Second, indicators for the regional reservoir of entrepreneurs (supply-side) and third, indicators for structural differences between regions other than industry-structure and size.

2.1 Indicator of regional demand

The regional demand is of great importance for young firms. Most of them trade on regional and local markets only. This is especially true for firms in the service-sector which contain more than 50% of all founded firms. As indicator of the regional demand during the analysed period on a regional level only the development of the number of employees is available.

---

[1] East-Germany is excluded because of insufficient data for most of the period. Data younger than 1997 could not be used, due to the introduction of the NACE-industry classification in 1998 that could not be transformed in the old classification.

Therefore the one year lagged development of the number of employees is included in the estimations.

But the relationship between both variables is not straightforward. That is because the change of the level of employment can stimulate or hinder the development of newly founded firms (see i.e.Keeble & Walker 1994). A positive trend fosters the regional demand and improves the economic prospects of the newly founded firms. That increases the motivation of entrepreneurs to found new firms and raises the prospects for survival of the new firms. In case that the growing number of employees is connected with an increase in population (in-migration), then this indicator has a supply-side influence as well. Young and good educated people are most likely to migrate and are moreover most likely to establish a firm. Therefore, with a positive migration balance the number of possible entrepreneurs increases disproportionately. But prospering regions offer attractive employment-alternatives to possible entrepreneurs. Thus the opportunity-costs for setting up a new business rise with the economic success of a region. This could lead to a negative correlation between the development of employment and the regional shares. The bivariate correlation-coefficients show no significant effect. This could be because both possible relationships offset a correlation.

2.2 Indicators for the regional reservoir of entrepreneurs

To assess the size of the pool of likely entrepreneurs the qualifications of the population is of great importance. According to a study conducted by Brüderl, Preisendörfer & Ziegler (1996: 85) in the greater Munich region, the share of new entrepreneurs that hold a university-degree is 23%. This is distinctly more than the average of all employees (16%). This result is similar to other studies (see Storey 1994 and literature mentioned there).

Spatial data on qualification of the whole labour force is not available for this period. Therefore we took the qualifications of employees liable to social insurance and the unemployed together and calculated the share of university-educated people on all.

Table 1: The dependent and independent variables

Variables	Description and Calculation	expected relationship
1. Indicators of regional demand		
Change of employment	Change of employment in the previous year of employees liable to social insurance	positive: increasing demand negative: alternative employment for potential entrepreneurs in prospering regions
2 Indicators for the reservoir of entrepreneurs		
Proportion of highly-qualified employees	Proportion of employees liable to social insurance with university-degree	positive
Unemployment rate	average unemployment rate	positive
Change of the unemployment rate	Change of the unemployment rate in the previous year	positive
Proportion of employees in small businesses	Proportion of employees liable to social insurance in firms with less than 50 employees	positive
3. Structural Indicators		
Population density	Average employees liable to social insurance in 1995 per square kilometre (log)	positive
Employees in R&D	Proportion of engineers, mathematicians and scientists on all employees liable to social insurance	positive
Technological regime	Proportion of engineers, mathematicians and scientists in firms with less than 50 employees divided by the share of employees with these qualifications in all employees	positive
Survival rate	Proportion of firms that survive at least three years	negative
4. Controlling for spatial autocorrelation		
Spill-over-effect	Mean of the founding rates (new firms divided by the number of employees) of the bordering regions	positive
Residuals	Mean of the residuals of the bordering regions	positive, if unobserved relationships exit

An unfavourable situation on the labour market is connected with low opportunity-costs because of a lack of alternatives. This might result in "entrepreneurs of need"(Bögengenhold & Staber 1990, Gerlach & Wagner 1994), which means people that put up their own businesses because they see no other way to get work. But empirical studies did not prove this connection, there was no evidence for a higher share of entrepreneurs under the unemployed in several studies (Brüderl, Preisendörfer & Ziegler 1996, Preisendörfer 1999: 54, Fritsch & Falk 2002). But if, in spite off these outcomes, an influence of "entrepreneurs of need" exists,

then it can be expected that such setting ups occur more often in times with raising unemployment. For this reason the one year lagged rate of change in unemployment is also included in the estimations.

On the other hand the rate of unemployment is widely seen as a sign of quantitative and structural problems of the labour market (Fritsch 1992, Gerlach & Wagner 1994, Storey 1994). Problems of the regional labour markets lead to lower levels of spending power and hence lower levels of demand. This would result in a negative influence on the value of the regional share.

Besides the number of potential entrepreneurs there are habitual factors that are much more difficult to measure. In parts these are based on regional traditions and attitudes that gave the cause for the "incubator-thesis". This assumption states that persons employed in smaller firms are more likely to set up a business of their own. It is thought that smaller firms allow a deeper insight into the running of a firm, whereas work in larger firms is more specialised. To measure this effect, the share of employees working in small firms is integrated in the estimations.

2.3   Indicators for structural differences between regions

An important structural-indicator is the population-density. It is used to assess the effect of agglomeration. Regions that have a positive regional share belong presumably those too, that are known as "innovative regions". Newly founded firms are widely seen as pioneers with the development and use of innovations. To quantify the regional innovative potential, two indicators are calculated. First the share of natural scientists and engineers is taken. If this share is more than the average, it is assumed that a regional level of innovations is accordingly higher than the average, too. But for the regional entrepreneurial potential it is – due to the "incubator-thesis" – more important if the natural scientists and engineers are working in smaller firms. Audretsch (1995) introduced the so called "technologic-regime" as an indicator for the innovative potential of the small-firms-sector of industries. This approach is used for regions in a similar way (Audretsch & Fritsch 2002). So the regional share of natural scientists and engineers working in SME is taken into the estimations. The higher its value, the higher the importance of the small-firm-sector for innovative activities in the regions and the higher is the entrepreneurial character of the regions.

As a forth indicator for structural differences between regions we included the average three years survival rate. If survival rates are low, this could have a discouraging effect on likely entrepreneurs. But results from Brixy and Grotz (2003) suggest a negative relationship between entry and survival. The cause is presumably the competition that rises with the number of competitors in the region.

2.4   Controlling for spatial autocorrelation

Spatial autocorrelation can cause that the standard deviation of the estimated coefficients is calculated too low. With these inefficient estimators the significance of the coefficients can not be calculated (Anselin & Rey 1991). Two variables are integrated to deal with this problem. First the mean of the regional share in the regions neighbouring each region. This indicator should have a positive influence with the depending variable, because it can be expected that nearer regions have more in common than those further away. This indicator, that also measures the amount of spill-over-effects, should therefore estimate the quantity of spatial autocorrelation. The second variable contains the means of the residuals of the neighbouring regions. With the help of this indicator it shall be measured if there are factors that are not considered but that influence these regions equally.

2.5   Bivariate correlations

The important descriptive statistics of the independent variables are shown in table 2. For most of the chosen independent variables a significant bivariate relationship exists with the dependent variable that comes up to the expectations (see table 3). Exemptions are the development of employment and the development of unemployment that both have no significant correlation with the regional share. Furthermore, the indicator for the regional technological regime shows a significant negative relation with the regional share which is contrary to the expectations. This might be due to correlations between the independent variables.

Table 2: Summary statistics for the regional variables

	mean	Standard-deviation	median
Change of the unemployment rate	-0,95	16,02	-3,18
Unemployment rate	8,02	2,88	7,73
Change of employment	1,63	1,89	1,69
Population density (log)	4,39	0,81	4,24
Technological regime	13,46	9,13	11,49
Proportion of employees in small business	40,69	5,90	40,26
Proportion of highly-qualified employees	4,88	1,84	4,43
Employees in R&D	0,02	0,01	0,02
birth rate	6,15	1,00	6,03
survival rate	57,91	2,57	57,88

Table 3: **Correlation-coefficients of the variables**

	Regional Share	Spill-over-effect	Change of the unemployment rate	Unemploy-ment rate	Change of employment	Survival rate
Spill-over-effect	0,412**	1,000				
Change of the unemployment rate	0,002	-0,053	1,000			
Unemployment rate	0,341**	0,442**	0,211**	1,000		
Change of employment	-0,045	-0,035	-0,727**	-0,335**	1,000	
survival rate	-0,334**	-0,174**	-0,121**	-0,266**	0,102*	1,000
Population density	0,342**	0,305**	0,065	0,062	-0,145**	-0,043
Technological regime	-0,223**	-0,048	-0,070	0,083*	0,075	--0,074
Proportion of employees in small businesses	-0,318**	-0,100*	0,024	0,003	0,012	-0,107*
Proportion of highly-qualified employees	0,357**	0,061	0,156**	-0,137**	-0,118**	-0,117*
Employees in R&D	0,250**	-0,035	0,133**	-0,187**	-0,106*	-0,034

	Population density	Technological regime	Proportion of employees in small businesses	Proportion of highly-qualified employees	Employees in R&D
Technological regime	-0,606**	1,000			
Proportion of employees in small businesses	-0,767**	0,754**	1,000		
Proportion of highly-qualified employees	0,623**	-0,619**	-0,590**	1,000	
Employees in R&D	0,610**	-0,758**	-0,679**	0,879**	1,000

** significant on 1% - level

* significant on 5% - level

3   Results of the estimations

The structure of the data (one observation per year and region) would suggest to estimate panel-models with fixed effects. But it was not possible to estimate reliable models. This was obviously because of a high degree of multicolliniarity between the independent variables and

the regional error-term (fixed-effects). We therefore estimated the regional shares with pooled OLS models[2].

Table 4: **OLS-estimates of the regional shares with robust standard-errors**

	I	II	IIa	III	IV	V	VI	VII
Change of the unemployment rate	-0.9023** (2.73)				-0.6434 (1.92)	-0.9582** (2.91)	-1.4301** (3.83)	-1.2345** (3.70)
Change of employment		10.4331** (4.03)	8.0088** (2.74)	2.7698 (1.37)				
survival rate	-16.1160** (6.64)	-16.0888** (6.71)	-14.5943** (5.71)	-19.3300** (7.38)	-18.3193** (6.60)	-17.7918** (5.96)	-13.3298** (5.95)	-15.3383** (6.27)
Unemployment rate	12.9670** (3.43)	14.1094** (3.61)	10.1587* (2.56)		12.6591** (3.53)	14.2774** (3.91)	17.6119** (5.25)	16.8082** (5.07)
Population density	56.6681* (2.29)	58.3226* (2.38)	51.7716* (2.04)	56.2560* (2.26)				
Proportion of employees in small businesses					-888.51** (3.64)			
Technological regime						-4.0305** (3.19)		
Proportion of highly-qualified employees							31.5233** (3.37)	
Employees in R&D								5317.8** (2.48)
Residuals	0.4011** (3.50)	0.4173** (3.70)		0.5218** (4.69)	0.4960** (4.59)	0.4569** (3.83)	0.3804** (3.25)	0.4557** (4.16)
Spill-Over			0.2973* (2.26)					
Observations	592	592		592	592	592	592	592
R²	0.3260	0.3328		0.3034	0.3690	0.3205	0.3782	0.3462
F-Test	21.00** (5. 73)	17.97** (5. 73)		20.58** (4. 73)	19.47** (5. 73)	16.70** (5. 73)	18.49** (5. 73)	18.34** (5. 73)

** significant on 1% - level

* significant on 5% - level

The results of the estimations are shown in table 4. It can be observed that there is a stable positive relationship of the population-density and the regional share (models I – III). Thus the regional share can be partly explained by positive agglomeration-effects. The proximity of customers on the one hand and suppliers on the other hand in densely populated areas offer entrepreneurs a favourable environment. Additionally the recruitment especially of highly educated employees is easier, too. However, this holds not in regions with survival-rates above average. The negative coefficient of this indicator points out that the number of newly founded firms rises with shrinking survival-chances for the new firms. This indicates that

---

[2] The temporal autocorrelation was controlled by using grouped observations (= 74 standard statistical areas) and the use of robust standard-errors (Software: Stata 7)

factors that increase the number of newly founded firms have the opposite influence on the survival-chances of new businesses and vice versa. Evidently a growing regional share is an indicator for increasing competition between the newly founded firms and hence connected with declining survival-rates. But this means that obviously low rates of firm survival does not deter entrepreneurs to start a new business.

The level of unemployment shows a positive effect. This points to the existence of "entrepreneurs of need". It should be kept in mind that the influence of different regional industry structures is excluded. Therefore differences in the industry structure between regions with a high or low unemployment rate have no influence, what underpins the relevance of these results.

The negative influence of the development of the unemployment is not in line with our expectations. We expected a rise in the entrepreneurial activity due to an influx of people into unemployment that choose to establish a business of their own ("entrepreneurs of need"). A reason for the absence of this connection could be that shortly after becoming unemployed, most people still hope to get a new job. Only after some time of unsuccessful search, they try to start a business of their own. The negative influence of the development of the unemployment is, however, a sign for a negative influence of the deterioration of the economy. Correspondingly a prospering economy, measured by the development of the employment, seems to foster the creation of new firms (model II). But this holds only if the level of unemployment is considered, too (model III). The limited validity of the development of employment is certainly caused by the negative correlation with the unemployment rate (see table 3). An explanation could be that an improving economy rises the number of newly founded firms especially in those regions with a high unemployment.

The share of employees working in small firms has – against our expectations – a declining impact on the regional share (model IV). After the exclusion of industry-specific-effects there seems to be no spatial influence left. That means we found no proof for the existence of a "seat-bet-effect". This could be because the share of employees working in SME is especially high in rural and peripheral areas. For this reason a large proportion of SME is not only an indicator for the entrepreneurial qualification of the employees but much more an indicator for a lack agglomeration-advantages. The same applies for the "regional technological regime" that shows a significant negative coefficient, too (model V). The technological regime shows, like the share of employees in SMEs, a strong negative relationship with the population-

density (see table 3). The values of this variable are higher the higher the values of the technological regime. So it can be assumed that, against the expectations in the first place, the share of natural scientists and engineers in SMEs measures the weight of SMEs in the regional economy and not the innovative capacity of SME.

The share of highly qualified employees, as well as a high share of employees in R&D, are a locational advantage for the setting up of new businesses. Both variables are highly correlated with the population density. So they can shed a light on the factors that are behind the urbanisation effects. The availability of knowledge in a region is a factor that has a positive influence on the number of newly founded firms. Regions with a large share of highly educated persons have an advantage in the use of new technologies and in the adaptation of changing preferences of customers. Often this knowledge is utilized by setting up a new business.

The two variables that control for spatial autocorrelation could not be included in the same estimation, because they are highly correlated. The positive relationship between spill-over-effect and residual-effect causes very similar estimations in both cases (models II and IIa). This leads to two conclusions. On the one hand there are only few differences between neighbouring regions as locations for new businesses. Regions in close vicinity follow similar economic conditions. The positive influence of the residuals on the regional share shows on the other hand that factors that are not considered in the estimations influence neighbouring regions in an equal way.

Taken together one can state that there are four main results. First, urbanisation-effects have a strong influence on the regional variation of the number of newly founded firms. Whereas in densely populated regions the milieu is especially favourable for entrepreneurs, the regional share in rural and peripheral regions is on average lower. A reason for this is presumably the spatial concentration of knowledge that is relevant for setting up new firms. Moreover, agglomeration-effects dominate the relationship between regional share and other regional indicators, like the share of employees in small firms or the technological regime.

Second, factors that have a positive influence on the number of newly founded firms seem to have a negative influence on the survival of new firms. In regions with a high level of new firm formation, the competition between new firms, which are typically focused on the local demand, is presumably high. That leads to relatively low levels of surviving firms.

Third, only the level of unemployment but not the development of unemployment, has a stimulating influence on new firm formation. A lack of opportunities on the labour market forces unemployed to set up their own firms: This happens not instantly after a rise of unemployment, though, but after realizing further prospects.

Fourth, we found a high degree of spatial autocorrelation. Neighbouring regions can be expected to have in many aspects similar economic conditions. It would be interesting to investigate the background of these factors on the amount of newly founded firms.

References:

Anselin, Luc and Serge Rey (1991): Properties of Tests for spatial dependence in linear regression models, Geographical Analysis, 23, 112-130.

Audretsch, David B. (1995), Innovation and Industry Evolution, Cambridge, MA: MIT Press.

Audretsch, David B. and Michael Fritsch (2002), Growth Regimes over Time and Space, Regional Studies, 36, 113-124.

Bögenholdt, D.; Staber, U. (1990): Selbständigkeit als ein Reflex auf Arbeitslosigkeit? Kölner Zeitschrift für Soziologie und Sozialpsychologie, 42, 265-279.

Brüderl, Josef, Peter Preisendörfer und Rolf Ziegler (1996), Der Erfolg neugegründeter Betriebe, Berlin: Duncker & Humblot.

Brixy, Udo; Grotz, Reinhold (2003): Regional Patterns and Determinants of the Success of New Firms in Western Germany. Paper presented at the 43rd Congress of the European Regional Science Association (ERSA), 27-31 August 2003 in Jyväskylä (Finland).

Fritsch, M. (1992): Regional Differences in New Firm Formation: Evidence from West Germany, Regional Studies, 25 (3), 233-241.

Fritsch, Michael and Oliver Falck (2002), New Firm Formation by Industry over Space and Time: A Multi-Level Analysis, Working Paper 2002/11, Faculty of Economics and Business Administration, Technical University Bergakademie Freiberg.

Gerlach, K.; Wagner, J. (1994): Regional Differences in Small Firm Entry in Manufacturing Industries: Lower Saxony, 1979-1991, Entrepreneurship and Regional Development, 6, 63-80.

Keeble, D.; Walker, S. (1994): New Firms and Dead Firms: Spatial Patterns and Determinants in the United Kingdom, Regional Studies, 28 (4), 411-427.

Preisendörfer, P. (1999): Zugangswege zur Selbständigkeit und die Erfolgschancen neugegründeter Unternehmen. In: von Rosenstiel, L.; Lang-von Wins, T. (Hrsg.): Existenzgründung und Unternehmertum, Stuttgart: Schaeffer-Poeschel, 49-71.

Reynolds, Paul; Storey, David; Westhead, Paul (1994): Cross-national Comparisons of the Variation in New Firm Formation Rates: An Editorial Overview, Regional Studies, 28, 4: 343-346.

Storey, David J. (1994): Understanding the Small Business Sector, London: Routledge.