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**The Persistence of Regional New Business Formation -
Activity over Time – Assessing the Potential of
Policy Promotion Programs**

by

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Abstract

We investigate regional differences in the level and the development of regional new business formation activity. There is a pronounced variance of start-up rates across the regions. The level of regional new firm formation is rather path-dependent so that changes are relatively small. The main factors determining the level of regional start-ups are innovation and entrepreneurship. These factors also seem to be responsible for changes in the level of regional new business formation. In addition, unemployment plays a role. Steering innovation and creating an entrepreneurial atmosphere could be an appropriate starting point for policy measures that try to promote start-ups. Our empirical evidence strongly suggests that such measures may have significant effect only in the long run.

JEL-classification: M13, O1, O18, R11

Keywords: New businesses, entrepreneurship, growth regimes, time lags.

Zusammenfassung

“Die Beständigkeit regionaler Gründungsaktivitäten über die Zeit – Eine Abschätzung des Potentials der Gründungsförderung“

Wir analysieren regionale Unterschiede des Niveaus von Gründungsaktivitäten und dessen Entwicklung. Die regionalen Gründungsdaten weisen eine ausgeprägte Streuung auf. Dabei ist eine deutliche Pfadabhängigkeit der Gründungsaktivitäten feststellbar, so dass Änderungen relativ gering ausfallen. Die wesentlichen Bestimmungsgründe für das Niveau der Gründungsaktivitäten sind Innovation und Unternehmertum. Diese Faktoren spielen auch für Veränderungen der regionalen Gründungsaktivitäten eine Rolle. Zusätzlich hat hier auch das Niveau der regionalen Arbeitslosigkeit einen Einfluss. Die Stimulierung von Innovationsaktivitäten und von Entrepreneurship stellen geeignete Ansatzpunkte für eine Politik dar, die auf eine Steigerung der Gründungsaktivitäten abzielt. Unser empirischer Befund weist allerdings darauf hin, dass ein wesentlicher Effekt solcher Maßnahmen erst längerfristig erwartet werden kann.

JEL-Klassifikation: M13, O1, O18, R11

Schlagworte: Regionalentwicklung, Unternehmensgründungen, Entrepreneurship, Wachstumsregime, Time Lags.

1. The problem

It is barely disputed that new business formation can have an important stimulating effect on economic development (Scarpetta, 2003). Recent empirical studies (Fritsch & Mueller, 2004a, b; Van Stel & Storey, 2004) have shown that such positive effects of new business formation do not occur immediately but in the long run. It is, however, less clear in how far new business formation is suited as a target variable for policy to stimulate economic growth. The purpose of this paper is to assess the potential for public policy measures that are aiming to steer the level of regional new business formation activity in order to stimulate growth. What are the appropriate starting points and measures of such a policy? Particularly, how long is the time period until first results will become visible?

Our analysis is divided into two parts. In the first part (section 3 and 4), we analyze the persistence of regional new business formation activity over a period of 20 years in order to assess the magnitude and the pace of changes that have occurred. The second part is devoted to identifying the factors that determine the level and the development of new business formation activity (section 5). Finally, we draw conclusions with regard to strategy and measures of a policy for stimulating new business formation and entrepreneurship (section 6). We begin with some basic information on the data and on measurement issues (section 2).

2. Data and measurement issues

Our information on new firm formation and regional employment is from the establishment file of the German Social Insurance Statistics, as described and documented by Fritsch & Brixy (2004). This database provides information about all establishments that have at least one employee subject to obligatory social insurance. The information on West Germany is currently available on a yearly basis for a relatively long time - a period of 20 years - ranging from 1983 - 2002.

Because the database records only businesses¹ with at least one employee, start-ups consisting of only owners are not included. In order to capture regional entrepreneurship we exclude new businesses with more than 20 employees in the first year of their existence; as a result, a considerable number of new subsidiaries of large firms contained in the database are not counted as start-ups.² Although the database only includes information at the establishment level, comparison with information on the regional distribution of headquarters of newly founded firms reveals a rather high correlation, thus allowing our data to also be regarded as an indicator for regional entrepreneurship (see Fritsch & Brixey, 2004, and the analyses in Fritsch & Grotz, 2002).

We restrict our analysis to West Germany because many studies indicate that the East German economy in the 1990s was a special case with very specific conditions that cannot be directly compared to those of West Germany (cf. Brixey and Grotz, 2004; Fritsch, 2004).³ The spatial framework is on the level of planning regions. These regions are functional units that consist of at least one core city and the surrounding area.⁴ Planning regions are somewhat larger than what is frequently defined as labor market area.

¹ We use the term 'new businesses' as the overall category for both new firm headquarters and new subsidiaries. Our empirical data include these two categories of new entities. For an analysis at the regional level, there are important differences between new firms and new establishments. One of these differences relates to the location of entrepreneurship. While both the set-up of new firms as well the set-up of subsidiary establishments involves some entrepreneurship, this entrepreneurship will be mainly sited at the firm's headquarters. The creation of a new branch plant in a region may, therefore, not be regarded as an indication for entrepreneurship there. Moreover, the location decision for a subsidiary could be influenced by factors that are rather different from those that determine the location of a new firm's headquarters. Restricting the empirical analysis to the firm level by including only new headquarters could make largely sure that the focus is on the effect of entrepreneurship. A potential disadvantage of such an analysis could be that it neglects the important effect that new branch plants may have for regional development.

² The share of new establishments in the data with more than 20 employees in the first year is rather small (about 2.5 percent). Applying a definition without a size-limit does not lead to any significant changes of the results.

³ The Berlin region was excluded due to changes in the definition of that region during the time period under inspection.

⁴ The definition of the planning regions from the year 1996 was used for the whole period to correspond with the late period in the data base. This enabled a consistent empirical framework between the two time-periods analyzed in this paper. For this definition of the planning regions see Federal Office for Building and Regional Planning (*Bundesamt für Bauwesen und Raumordnung*, BBR) (2003).

The number of start-ups that occur in a region within a certain time period is only of limited significance for an interregional comparison because it does not account for the economic potentials of these regions. In order to be able to judge if the level start-up activity in a certain region is relatively high or relatively low compared to other regions, or if some regions are more entrepreneurial than other regions, the number of start-ups should be related to the economic potential of the region. Therefore, a start-up rate should be determined. There are a number of alternative ways to calculate such a start-up rate.⁵ We use the start-up rate according to the 'labor market' approach. This means that the number of start-ups per period is divided by the number of persons in the regional workforce at the beginning of the respective period, including those persons that are recorded as unemployed. This kind of start-up rate is based on the notion that all members of the workforce are faced with the decision to work as dependent employees in someone else's business or to start their own firm. Because start-ups are usually located close to the founder's residence (Gudgin, 1978; Mueller and Morgan, 1962; Cooper and Dunkelberg, 1987), the regional workforce can be regarded as an appropriate measure of the number of potential entrepreneurs. The entry rate according to the labor market approach may be interpreted as the propensity of a member of the regional workforce to start his or her own business.

3. The development of new business formation 1983-2002

During the 1983-2002 period, there were about 126,000 start-ups in the private sector on average per year. Over the years, the number of start-ups increased slightly with a relatively distinct rise between 1990 and 1991 and between 1997 and 1999.⁶ The difference between the average number of new businesses in the 1983-89 and the 1990-1997 period was about 12.3% and the difference between the average number of start-ups in the 1990-1997 and the 1998-2002 period was

⁵ See Audretsch and Fritsch (1994) for different approaches of calculating start-up rates.

⁶ The reasons for these two increases are largely unclear. It would not be very farfetched to suspect that the rise of the number of start-ups between 1990 and 1991 was caused by the unification of East and West Germany in the year 1990. However, we could not find any further indication for this hypothesis in the data. The rise between 1997 and 1999 coincides with a change of the sector classification system of the Social Insurance Statistics, but again, it remains unclear how this change could have affected the number of start-ups that was recorded.

about 16.6%. The majority of the new businesses, about 93,400 per year (74% of all start-ups), were in the service sector compared to about 13,800 new establishments per year (11% of all start-ups) in manufacturing.⁷ There was an overall trend towards an increasing share of start-ups in the service sector and a corresponding decreasing share in manufacturing (Figure 1). In the service sector, the largest number of new establishments was set up in wholesale and resale trade, hotels and inns, and the non-specified “other” services. In manufacturing, most start-ups were in electrical engineering, furniture and food.

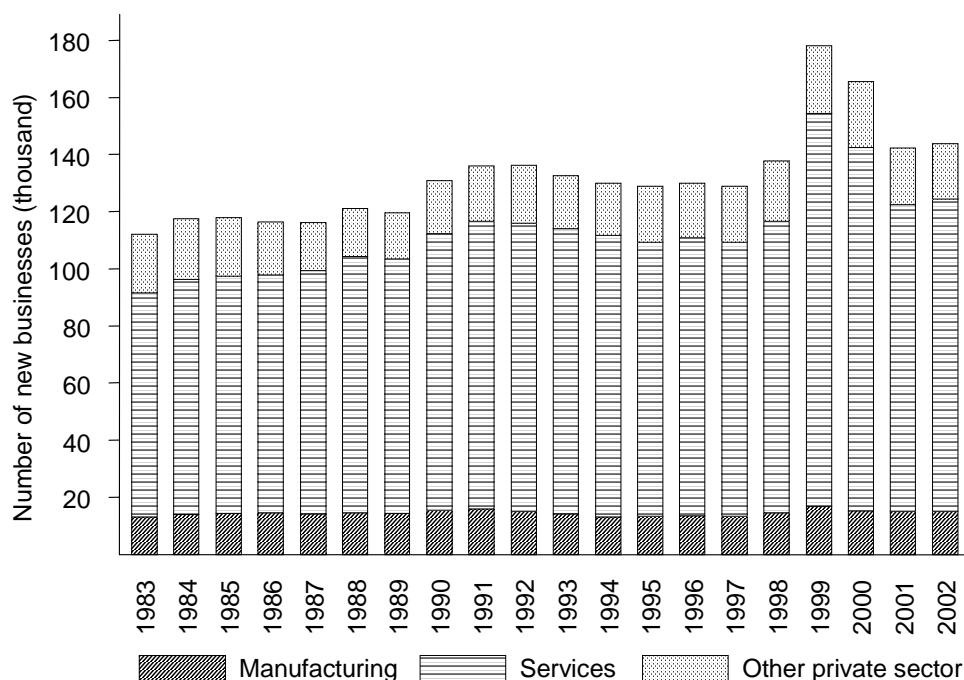


Figure 1: Number of start-ups per year in West Germany 1983-2002

The development of the number of start-ups is rather steady, not only for the West German economy as a whole but also on the level of planning regions (Figure 2). We use start-up rates for an examination of the level of new business formation activity in regions in order to draw comparisons. Investigating the relationship between regional start-up rates (number of new businesses per 1,000 workforce) in different years shows rather high correlation coefficients (Figure 2 and Table A1 in the Appendix). In most cases the correlation coefficient of start-

⁷ The “other private sectors” are agriculture and forestry, fishery, energy and water supply, mining and construction.

up rates in subsequent years assume values between 0.96 and 0.98. The relationship is not as close for years that are farther apart, but even over a ten, 15 and 19 year period the value of the correlation coefficient always remains above 0.8. There is some slight variation with regard to the closeness of the relationship between the different years, but the basic pattern is remarkably constant. Obviously, entrepreneurial activity is rather persistent over time – on the national and on a regional level.

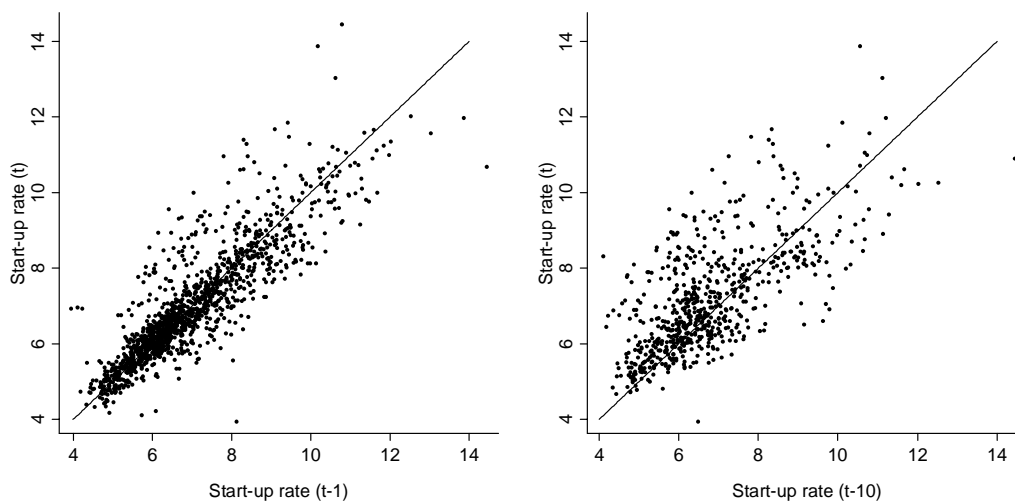


Figure 2: Relationship between start-up rates in subsequent years (t and $t-1$) and over a ten year period (t and $t-10$)

There is high variation between start-up rates over space (Figure 3). While the average of the minimum value over the years is 4.72, the maximum start-up rate has an average value of 11.40 (Table A2 in the Appendix). The minimum values, the lower percentiles of the distribution (5%, 10%, and 25%) and the median are relatively close together compared to the spread of values in the upper part of the distribution. This means that there is much more variation between the regions with relatively high start-up rates than between regions with low levels of new business formation activity.

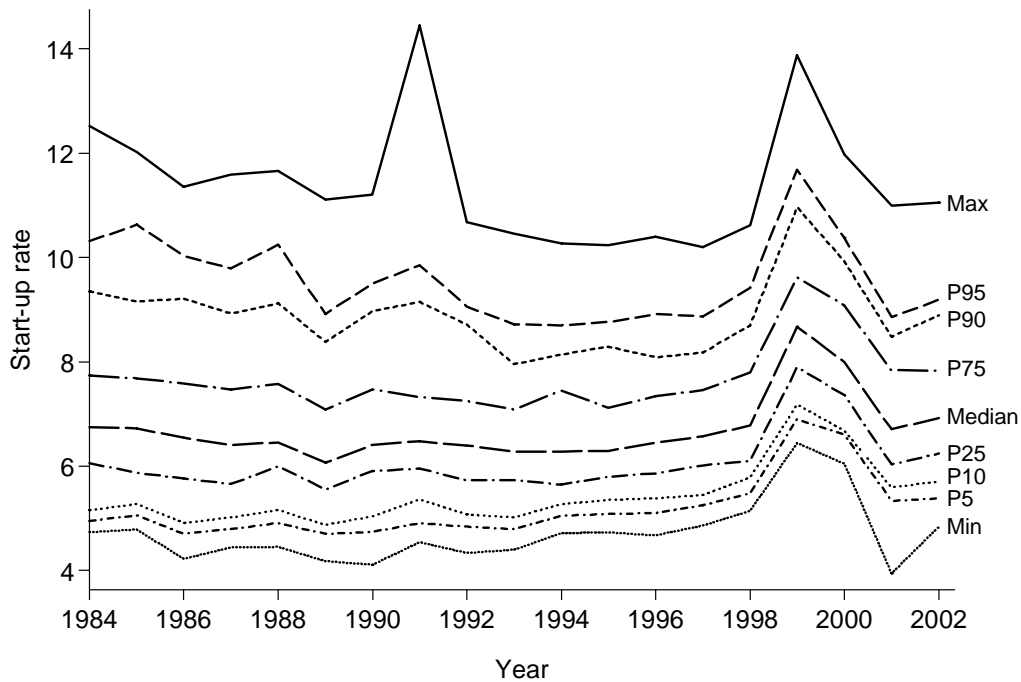


Figure 3: Development of new business formation rates 1984-2002 – all private sector industries

Comparing start-up rates between services and manufacturing shows that values are much higher in the service sector (Table 1).⁸ There are two explanations for higher start-up rates in services. The first being barriers to entry, such as minimum efficient size are considerably lower in services than in manufacturing. Secondly, there is a pronounced trend towards increasing employment in services. For the private sector as a whole there is no general trend of regional start-up rates to fall or to increase over the years. This result is somewhat surprising given the rising share of service employment and the relatively high start-up rates in services.

⁸ The start-up rates for the services and manufacturing are only related to employees in each sector and not to the unemployed. The reason is that unemployed persons cannot be assigned to a specific sector because we do not have information about the employment history of the unemployed persons.

Table 1: Start-ups and start-up rates over time and sectors⁺

Year	Number of new businesses			Share on start-ups in all private industries (%)		Start-up rate (%)		Ratio number of employees Services / Manufacturing
	Private sector	Services	Manufacturing	Services	Manufacturing	Services	Manufacturing	
1983	112,092	78,407	13,147	69.95	11.73	12.49	1.75	0.84
1984	117,519	82,388	14,015	70.11	11.93	12.99	1.92	0.87
1985	117,765	83,102	14,376	70.57	12.21	12.92	1.90	0.85
1986	116,406	83,242	14,626	71.51	12.56	12.76	1.89	0.84
1987	116,173	85,232	14,061	73.37	12.10	12.65	1.81	0.86
1988	121,083	89,731	14,543	74.11	12.01	12.93	1.87	0.89
1989	119,604	88,918	14,458	74.34	12.09	12.49	1.82	0.90
1990	130,801	96,841	15,354	74.04	11.74	12.96	1.88	0.92
1991	135,985	100,870	15,765	74.18	11.59	12.80	1.89	0.95
1992	136,123	100,914	15,005	74.13	11.02	12.33	1.82	0.99
1993	132,521	99,804	14,243	75.31	10.75	12.09	1.84	1.07
1994	129,975	98,421	13,133	75.72	10.10	11.87	1.80	1.13
1995	128,911	96,031	13,294	74.49	10.31	11.51	1.85	1.16
1996	129,942	97,214	13,552	74.81	10.43	11.57	1.94	1.21
1997	128,950	96,081	13,261	74.51	10.28	11.35	1.95	1.25
1998	137,756	102,102	14,548	74.12	10.56	11.87	2.14	1.27
1999	178,098	137,675	16,652	77.30	9.35	15.29	2.48	1.34
2000	165,565	127,242	15,235	76.85	9.20	13.50	2.26	1.40
2001	142,154	107,541	14,912	75.65	10.49	10.82	2.18	1.46
2002	143,773	109,465	14,976	76.14	10.42	11.21	2.27	1.48

⁺ Start-up rates for services and manufacturing do not include unemployed persons.

A variation of start-up rates over time can have two sources, changes in the number of start-ups (the numerator of the start-up rate) or the regional workforce (the denominator). We find that the coefficient of variation for the number of start-ups is always higher than for the number of employees, thus indicating that changes of start-up rates are mainly caused by variation of new business formation activity (Table 2).

Table 2: Coefficients of variation

Mean of regional values:	
▪ Number of workforce	6.94
▪ Number of start-ups	12.99
▪ Start-up rate	11.09
Median of regional values:	
▪ Number of workforce	6.44
▪ Number of start-ups	12.97
▪ Start-up rate	11.36

4. Regional new business formation and the national trend

Ordering regions by their start-up rates in ascending or descending order gives their rank position with regard to the level of new business formation activity. Rank positions of regions display their relative performance with regard to a certain indicator independent of the national trend. Rank 74 is assigned to the region with the highest start-up rate and rank 1 to the regions with the lowest rate. Because our interest is not in short run fluctuations, but rather the developments in the medium and long run, we analyze the changes of rank positions between five-year periods - the average start-up rates in the 1984-1987, 1988-1992, 1993-1997, and 1998-2002 period are being analyzed.

Table 3: Average start-up rates of five year periods

	Average regional start-up rate per period				
	Rank 1	Rank 74	25 percentile	Median	75 percentile
Period I (1984-1987)	4.68	11.87	5.88	6.52	7.54
Period II (1988-1992)	4.54	11.74	5.89	6.34	7.27
Period III (1993-1997)	4.68	10.31	5.84	6.34	7.27
Period IV (1998-2002)	5.56	11.54	6.83	7.42	8.49

There are large differences between the regions with the lowest and highest start-up rate (Table 3). In all periods the values of highest and lowest start-up rate are roughly the same. Changes in rank positions occur and changes tend to be relatively modest (Table 4). The regions hardly experience a rank change of more than twenty rank positions between two successive five-year periods. The number of regions with rank changes of more than twenty rank positions increases with the length of time period. Between period I and III (II and IV) five (six) regions change more than twenty rank positions. Between period I and IV this number ascends to nine regions, representing 12.16 percent of all regions.

Table 4: Change of rank positions of start-up rates between five year periods

	Number of rank positions changed between period ⁺							Maximum ⁺⁺
	0	≤ 3	≤ 5	≤ 10	≤ 15	≤ 20	> 20	
I → II	4	40	47	64	68	74	0	19
	5.41	54.05	63.51	86.49	91.89	100.00	0.00	(46 → 27)
II → III	8	33	47	64	70	71	3	25
	10.81	44.59	63.51	86.49	94.59	95.95	4.05	(21 → 46)
III → IV	10	41	53	66	69	74	0	20
	13.51	55.41	71.62	89.19	93.24	100.00	0.00	(44 → 24) (32 → 12) (45 → 25)
I → III	3	25	33	57	65	69	5	27
	4.05	33.78	44.59	77.03	87.84	93.24	6.76	(19 → 46)
II → IV	7	31	39	56	64	68	6	31
	9.46	41.89	52.70	75.68	86.49	91.89	8.11	(51 → 20)
I → IV	1	17	30	50	56	65	9	30
	1.35	22.97	40.54	67.57	75.68	87.84	12.16	(65 → 35) (50 → 20)

⁺ First row: number of regions; second row: share of all regions (percent); change of ranks in absolute numbers.

⁺⁺ Last column: absolute number of ranks, rank positions in parentheses, highest rank = rank 74.

On average less than half of the regions experienced a change of more than three rank positions between two successive time periods. In more than 85 percent of the regions changes between two successive time periods did not exceed ten rank positions. The greatest change between two successive periods amounted to 25 rank positions. Over three periods (period I → III or period II → IV) the maximum number of rank position changed is 27 and 31, respectively. The maximum change over four periods (period I → IV) is 30 rank positions. However, only four planning regions increased more than 20 ranks over three successive periods.⁹

5. Determinants of new business formation

Empirical analysis of the factors that determine new business formation rates can provide indications for policy measures that might be suited to influence regional new business formation activity. Two types of this kind of analysis were

⁹ These are the planning regions Hamburg, Cologne, Duisburg/Essen and the region around Aschaffenburg (southeast of Frankfurt a. M.).

conducted. Firstly, we try to explain the level of regional new business formation by analyzing the start-up rate and the rank position of the regional start-up rate (section 5.1). Secondly, the determinants of the regional start-up rate found are then used to investigate the factors that are associated with changes in regional new business formation activity (section 5.2). This analysis of regional new business formation necessarily neglects those determinants that do not vary much among regions such as the national tax policy or the welfare system.

5.1 What determines the level of regional start-up activity

It is a key hypothesis in the literature that entrepreneurship is closely linked to innovation activity and structural change. Particularly the qualification of the regional workforce and the intensity of entrepreneurial “spirit” in a region may have a pronounced effect on the level of new business start-ups (see Fritsch and Falck, 2002, Armington and Acs, 2002, Reynolds, Storey and Westhead, 1994 for an overview). Unemployment might cause the setting up of an own business to look relatively attractive, and therefore can also constitute a main source of entrepreneurship. Some empirical analyses indicate that a part of new businesses is set up by unemployed persons, but that the propensity of becoming a founder is lower for the unemployed persons than for people that currently have a job (Fritsch and Falck, 2002). New business formation may also be driven or restricted by demand. The availability of resources, particularly the owner’s equity capital, may constitute a severe bottleneck for the founding of an own business.

We use two indicators for the level of new business formation activity as dependent variables in the regressions, the start-up rate and the rank of the start-up rate among the planning regions. Both variables are defined per year. There are two advantages of taking the rank of the start-up rate as a dependent variable. Firstly, the rank position is largely independent of the national trend. Secondly, rank positions are of ordinal character and should, therefore, be less exposed to extreme values than start-up rates. For these reasons, the results for the rank of the start-up rate can be expected to be rather robust. However, we did not find any fundamental differences with regard to the relative importance of different factors

between the estimations based on start-up rates and the ranks of the start-up rate. The value of the start-up rate is restricted at the lower end because it can not become less than zero. Therefore, Tobit regression may be the appropriate method of analysis. However, that ordinary least squares regression (OLS) leads to roughly identical results. The OLS-estimates are provided here because interpretation of coefficients and assessment of the quality of the estimation is simplified. Due to the whole-numbered character of the rank start-up rate, OLS regression on rank values (rank regression) is also applied. Besides pooled regressions we also applied panel regression with random effects in order to exploit the panel character of our data set.¹⁰ To avoid causality problems, we related the exogenous variables to years before the start-ups occurred.¹¹

Our estimations of the determinants of new business formation activity largely confirm the expectations (cf. Table 5). The main determinants of regional new business formation found are regional innovation activity, the regional level of entrepreneurship and the sector structure as measured by the share of service sector employment. In addition to these factors, the regional unemployment rate, population density as well as gross value added per employee play a role. Moreover, a pronounced spatial autocorrelation is found. Innovation activity is measured as the number of employees devoted to R&D per 1,000 employees; we found a significantly positive impact on start-up activity. The results of the panel regressions indicate a somewhat weaker impact of innovation activity on entrepreneurial activity than in the pooled regressions.¹² This difference may result from the fact the level of regional innovation activity tends to be rather constant over time so that this level is partly classified as region specific effect.

¹⁰ Fixed effect regressions are obviously not appropriate for our analysis because of the path dependency and small changes of start-up rates over time. Applying this method to our data, we find that a large part of the path dependency is included into the region specific fixed effect.

¹¹ The differences as compared to models in which the exogenous variables are for the same year as the start-ups are, however, negligible. This indicates that reversed causality is not a problem in these models.

¹² The impact of innovation activity proves to be highly significant even in the panel regressions if only data for the 1990s are included into the model.

Table 5: Determinants of new business formation

	Start-up rate				Rank of start-up rate		
	Pooled regression		Panel regression		Pooled regression	Panel regression	
	OLS	Robust (HWS)	Random effects	Robust (HWS)		OLS	Random effects
R&D employees per 1000 employees (ln) lag1	0.17** (2.81)	0.17** (2.73)	0.15 (1.73)	0.17 (1.40)	2.79** (2.84)	-0.04 (0.03)	2.79* (2.01)
Employees _{≤20} / employees _{all} lag1	0.04** (10.83)	0.04** (5.85)	0.05** (9.84)	0.04** (3.15)	0.46** (7.41)	0.54** (6.75)	0.46** (3.34)
Unemployment rate lag1	0.02** (4.41)	0.02** (4.33)	0.02** (3.52)	0.02* (2.39)	0.17* (1.98)	0.09 (0.72)	0.17 (1.44)
Share employees in services lag1	0.03** (8.78)	0.03** (8.03)	0.04** (9.06)	0.03** (4.62)	0.30** (5.47)	0.44** (5.35)	0.30** (3.39)
Population density (ln)	-0.20** (6.08)	-0.20** (5.71)	-0.34** (6.85)	-0.20* (3.63)	-0.37 (0.66)	-1.29 (1.46)	-0.37 (0.41)
Gross Value Added per employee lag5	0.01** (3.41)	0.01** (3.37)	0.01** (3.63)	0.01 (1.86)	-0.04 (1.30)	-0.04* (1.08)	-0.04 (0.98)
Start-up rate lag5	0.59** (32.65)	0.59** (22.76)	0.45** (20.71)	0.59** (14.14)	—	—	—
Rank start-up rate lag5	—	—	—	—	0.78** (40.55)	0.60** (24.05)	0.78** (20.19)
Spatial lag (ρ)	0.97** (41.05)	0.97** (36.65)	0.95** (43.28)	0.97** (28.05)	0.54** (9.10)	0.54** (8.35)	0.54** (7.18)
Constant	-0.03* (0.13)	-0.03* (0.11)	0.77* (2.09)	-0.03 (0.06)	-22.48** (5.38)	-9.69** (1.61)	-22.48** (2.86)
R ² -adjusted	0.89	0.89	0.88	0.89	0.85	0.84	0.85
F-value / Wald chi ² (random effects)	961.21	553.62	4687.31	240.10	666.28	1686.69	448.12
Observations	962	962	962	962	962	962	962

Notes: * significant at 5%-level, ** significant at 1%-level, t-values in parentheses. HWS: Huber-White robust estimator.

The share of employees in establishments with less than 20 employees represents the regional level of entrepreneurship for a least three reasons. Firstly, small firms can be regarded a seedbed for entrepreneurship. This is based on the observation that employees in small firms often show a higher propensity of starting a business on their own than employees in larger firms (Beesley and Hamilton, 1984; Wagner, 2004; Wagner and Sternberg, 2004). Secondly, a high proportion of small firm employment may indicate low minimum efficient size of the industries in the respective region that can be assumed favorable for entry (Fritsch and Falck, 2002). Thirdly, a small average establishment size means that there is a relatively high number of establishments and entrepreneurs located in that region. Accordingly, we find a pronounced positive relationship between the share of small firm employment in a region and the self-employment rate.

The regional unemployment rate has a positive impact in some estimations but it is not always statistically significant. Other analyses found that, although, some new businesses are set up by unemployed persons, the propensity of becoming an entrepreneur is relatively low for unemployed persons as compared to people that are currently employed (Fritsch and Falck, 2002). Many service industries tend to have relatively high entry rates when compared to manufacturing. We include the share of employment in the service sector to account for this effect that comes out to be relatively pronounced. Population density is meant to work as a 'catch all' variable for a multitude of regional characteristics such as availability of qualified labor, land prices and the level of regional knowledge spillovers. We find a negative value of the respective correlation coefficients in some regressions indicating that the net-effect of all these factors may not be stimulating for new business formation, i.e. there are agglomeration diseconomies. Gross value added per employee may be regarded an indicator for the regional income level as well as for labor productivity. It is, to a considerable degree, influenced by the qualification of the regional workforce and other factors that contribute to the competitiveness of the regional economy. The positive coefficients for gross value added per workforce indicate that all these factors may have a stimulating effect on new business formation. We did not find any significant impact of the change of regional gross value added on the level of start-ups; it was, therefore, omitted in the empirical model. This

means that the level of regional new business formation activity is not driven by demand.

The highly significant positive value for the regional start-up rate and the rank of the regional start-up rate in the preceding five-year period points to path dependency of regional new business formation. Omitting this variable in the regressions leads to a decrease of the R^2 -value, particularly in models with the rank start-up rate as a dependent variable. Spatial autocorrelation is existent and statistically significant indicating the presence of positive neighborhood effects of new business formation in adjacent regions.

5.2 Why do changes of regional start-up activity occur

To analyze the factors that determine changes of regional new business formation activity, the difference of rank positions was used as dependent variable (cf. Table 6). The change in the number of rank positions of the regional start-up rate has the character of an ordinal whole valued variable (positive for rising and negative for falling in rank values), and pooled and panel regressions are applied. The set of explanatory variables is similar to the variables employed for investigating the level of regional start-up activity. In addition to that, the change of gross value added during the preceding five year period as indicator for the development of regional demand is included.

As in the analyses for the level of start-ups, regional innovativeness has a positive effect on an increase of regional new business formation activity, measured in rank value changes (Table 6). The same is true for the share of employment in establishments with less than 20 employees. Apparently, high levels of regional innovation and entrepreneurship fuel new business formation processes. The positive sign for the already existing level of entrepreneurship in the regressions for the change of the level of start-up activity indicates that entrepreneurship is to a degree self-energizing. We also find a significantly positive coefficient in the pooled regressions. Obviously, regional unemployment may have a stimulating effect on new business formation in the long run.

Table 6: *Determinants of changes in new business formation (change rank of start-up rate)*

	Pooled regression		Panel regression	
	OLS	Robust (HWS)	Random effects	Robust (HWS)
R&D employees per 1000 employees (ln), lag1	3.85** (3.55)	3.85** (3.74)	3.86* (2.45)	3.85* (2.20)
Employees _{s<20} / employees _{all} , lag1	0.43** (6.11)	0.43** (4.56)	0.52** (6.23)	0.43** (5.86)
Unemployment rate, lag1	0.34** (3.29)	0.34** (3.34)	0.32* (2.27)	0.34* (2.26)
Share employees in services, lag1	0.14** (2.57)	0.14** (2.52)	0.25** (2.98)	0.14 (1.59)
Population density (ln)	0.94 (1.42)	0.94 (1.47)	0.28 (0.28)	0.94 (1.03)
Gross value added change of 5 years, lag5	0.07* (2.26)	0.07* (2.14)	0.13** (4.13)	0.07 (1.88)
Rank start-up rate lag5	-0.16** (6.62)	-0.16** (6.30)	-0.27** (8.20)	-0.16** (4.28)
Change of rank start-up rate 5 years, lag5	-0.39** (10.98)	-0.39** (8.51)	-0.57** (15.99)	-0.39** (7.62)
Spatial lag (ρ)	0.55** (7.52)	0.55** (7.77)	0.50** (6.37)	0.55** (5.76)
Constant	-34.86** (7.02)	-34.86** (6.04)	-34.97** (5.21)	-34.86** (4.98)
R ² -adjusted	0.25	0.26	0.22	0.26
F-value	25.21	20.52	326.42	14.49
Observations	666	666	666	666

Notes: * significant at 5%-level, ** significant at 1%-level, t-values in parentheses. HWS: Huber-White robust estimator.

The negative coefficient for the lagged start-up variable indicates that if the level of start-up activity has been relatively high in a certain period, it is more likely to decrease than further increase in the next period.¹³ Population density does not have a statistically significant effect on the development of the start-up rate. The positive coefficient for the share of service employment indicates that regions with a high concentration in services experience relatively pronounced increases in the level of new business formation. Reversed causality might obviously be an issue in this model. We deal with this kind of reversed causality by including a lagged dependent variable, the development of start-ups in the preceding period, as an explanatory variable, which proves to be highly significant.¹⁴

Based on these estimates we can conclude that many of the variables that influence the level of new business formation activity in a region also have an effect on the change of entrepreneurial activity. The main factors that lead to increasing start-up rates are regional innovativeness, the already existing level of entrepreneurship and to some extent the regional level of unemployment. A change in the level of regional demand measured as gross value added per workforce does not appear to stimulate new business formation activity. This implies that regional new business formation activity is mainly driven by factors on the supply side and not by regional demand.

6. How feasible is entrepreneurship?

We found considerable differences of regional start-up rates and it is quite likely that these differences have consequences for regional development, albeit in the long run. The level of regional new business formation activity shows a pronounced path dependency and persistence over time. Regions with relatively high rates of new business formation in the past are very likely to experience a

¹³ This follows, to some part, from the very nature of the rank positions. If a region has attained the highest possible rank position, there can be no additional increase and there can be no decrease from the lowest rank position.

¹⁴ The question is whether x causes y and how much of the current y can be explained by past values of y . If additional lagged values of x improve the explanation, y is said to be Granger-caused by x if the coefficients of the lagged x s are statistically significant (Granger, 1969).

correspondingly high level of start-ups in the future. Accordingly, regions with a low level of new businesses today can be expected to have only relatively few start-ups in the near future. As far as changes in the level of regional start-up activity do occur, they emerge over quite a long period of time, and they are in most cases rather small. This high degree of persistence suggests that there are only weak prospects for rapid change with regard to regional new business formation activity. Therefore, a policy that is aiming at stimulating the regional level of entrepreneurship needs patience and a long-term orientation. According to our results, it appears quite likely that the main benefits of such a policy will arise only for future generations but not for the current one. We should perhaps qualify this conclusion by pointing out that we have not investigated the effect of public policy programs that are aiming at promoting start-ups in certain regions.

Therefore, our finding that changes of the regional level of new firm formation activity are small and slow should not be misconceived as an evaluation of the effectiveness of such policies. But we can state that we did not detect any sign of any policies in operation that led to quick and large changes of the level of regional new firm formation activity.

Our analyses of these factors that determine the level and the development of regional new business formation clearly indicate a strong influence of innovation and of the already existing level of entrepreneurship. These two issues should be the main starting points for a policy that would like to stimulate new businesses formation in certain regions. One should, however, be aware that a number of factors that might have a significant impact on the level of entrepreneurial activity are mainly decided on a national level and in most countries do not differ much between regions (Audretsch et al., 2002). Such issues that may stimulate or hamper entrepreneurship concern tax and welfare arrangements as well as the general economic development (Van Stel and Stunnenberg, 2004). A high level of ownership taxation could considerably reduce the propensity to start an own business. Likewise, generous unemployment benefits and other social welfare arrangement may weaken the incentive to be an entrepreneur (Verheul et al. 2002).

Suggesting measures for stimulating the level of entrepreneurial activity does in no way mean that policy should neglect the larger firms. Large firms also make a significant contribution to regional development and may be particularly important as an incubator of new firms, namely the seedbed of spin-offs. It is indeed crucial for regional development to have a 'right' combination of both the small firms and the major enterprises.

Future research should focus on at least two questions. First, what kind of measures would be appropriate for stimulating a regional culture of entrepreneurship? Second, what type of innovation promotion policy would be suited for raising the level of entrepreneurship? If entrepreneurship 'capital' is an important resource for growth we should try to learn much more about ways in which it can be created.

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Appendix

Table A1: Correlation matrix of start-up rates 1984-2002[†].

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002		
1985	0.97	1.00																			
1986	0.93	0.96	1.00																		
1987	0.95	0.96	0.95	1.00																	
1988	0.89	0.92	0.92	0.95	1.00																
1989	0.94	0.95	0.94	0.97	0.96	1.00															
1990	0.92	0.93	0.92	0.93	0.91	0.95	1.00														
1991	0.92	0.91	0.88	0.94	0.93	0.95	0.91	1.00													
1992	0.94	0.95	0.92	0.96	0.95	0.97	0.96	0.96	1.00												
1993	0.91	0.89	0.86	0.92	0.89	0.94	0.93	0.94	0.96	1.00											
1994	0.91	0.90	0.86	0.91	0.88	0.93	0.91	0.93	0.95	0.97	1.00										
1995	0.93	0.91	0.88	0.92	0.88	0.93	0.92	0.94	0.96	0.97	0.98	1.00									
1996	0.90	0.88	0.86	0.91	0.89	0.93	0.90	0.93	0.95	0.96	0.96	0.97	1.00								
1997	0.88	0.87	0.84	0.90	0.88	0.92	0.90	0.92	0.95	0.96	0.95	0.95	0.96	1.00							
1998	0.91	0.89	0.88	0.92	0.90	0.93	0.89	0.93	0.95	0.94	0.95	0.95	0.96	0.95	1.00						
1999	0.87	0.84	0.81	0.87	0.85	0.90	0.86	0.89	0.92	0.94	0.93	0.93	0.95	0.93	0.94	1.00					
2000	0.86	0.84	0.81	0.88	0.86	0.90	0.88	0.89	0.92	0.93	0.92	0.92	0.96	0.95	0.94	0.97	1.00				
2001	0.80	0.79	0.76	0.84	0.82	0.86	0.82	0.86	0.88	0.89	0.88	0.88	0.91	0.92	0.89	0.90	0.92	1.00			
2002	0.84	0.82	0.81	0.87	0.88	0.90	0.86	0.90	0.92	0.92	0.91	0.92	0.95	0.95	0.94	0.93	0.96	0.92	1.00		

[†] All coefficients are statistically significant at the 1%-level.

Table A2: Distribution of start-up rates over time and regions

Year	Min	Max	Percentiles						
			5%	10%	25%	50%	75%	90%	95%
1984	4.74	12.52	4.95	5.16	6.06	6.74	7.73	9.35	10.31
1985	4.79	12.02	5.06	5.28	5.87	6.73	7.69	9.15	10.63
1986	4.23	11.35	4.70	4.92	5.76	6.55	7.58	9.21	10.03
1987	4.45	11.59	4.79	5.02	5.66	6.40	7.47	8.92	9.79
1988	4.46	11.66	4.91	5.16	6.00	6.46	7.58	9.12	10.24
1989	4.18	11.11	4.70	4.88	5.56	6.07	7.09	8.38	8.92
1990	4.11	11.21	4.74	5.04	5.91	6.41	7.47	8.97	9.50
1991	4.55	14.44	4.91	5.37	5.95	6.48	7.33	9.15	9.86
1992	4.34	10.68	4.84	5.08	5.73	6.40	7.25	8.71	9.06
1993	4.40	10.45	4.80	5.02	5.74	6.28	7.09	7.96	8.72
1994	4.72	10.27	5.05	5.27	5.65	6.28	7.45	8.14	8.70
1995	4.73	10.23	5.09	5.35	5.80	6.30	7.12	8.29	8.77
1996	4.68	10.39	5.11	5.39	5.86	6.45	7.34	8.09	8.92
1997	4.86	10.20	5.25	5.45	6.02	6.57	7.46	8.18	8.87
1998	5.14	10.62	5.48	5.78	6.10	6.78	7.79	8.70	9.41
1999	6.45	13.87	6.90	7.18	7.90	8.68	9.62	10.96	11.68
2000	6.05	11.97	6.60	6.68	7.36	8.00	9.08	9.92	10.37
2001	3.94	10.99	5.34	5.59	6.03	6.71	7.84	8.49	8.86
2002	4.84	11.05	5.38	5.71	6.25	6.92	7.84	8.89	9.19
Mean	4.72	11.40	5.19	5.44	6.06	6.69	7.67	8.87	9.57

Notes: New businesses in relation to the labor-force and the unemployed persons.