

The persistence of regional new business formation-activity over time – assessing the potential of policy promotion programs

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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 business formation is rather path-dependent so that changes are relatively small. The main factors determining the level of regional start-ups are innovation and an entrepreneurial climate. 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.

Keywords New businesses · Entrepreneurship · Growth regimes · Time lags

JEL Classification M13 · O1 · O18 · R11

1 The problem

It is barely disputed that new business formation¹ can have an important stimulating effect on economic development (Carree and Thurik 2003; Scarpetta 2003).

¹The term new business is used as the overall category for both new firm headquarters and new plants since the dataset does not differentiate between these two categories of new entities.

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Nevertheless, recent empirical studies (Fritsch and Mueller 2004; Van Stel and Storey 2004) have shown that such positive effects of new business formation do not occur immediately but in the medium and long run. It is less clear in which regard public policy is able to influence the level of new business formation. In this paper regional differences in new business formation and their persistence over time are investigated. The results should allow assessing the potential for public policy measures that are aiming to steer the level of regional start-up activity in order to stimulate growth. Moreover, the purpose is to identify appropriate starting points of such a policy. This paper explores the questions what can be done to promote the regional level of new business formation and when the first results might become visible.

This study is divided into two parts. The first part analyzes 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 (Section 3). The second part is devoted to identifying the factors that determine the level and the development of new business formation activity (Section 4). Finally, Section 5 discusses conclusions for a policy that aims at stimulating new business in order to promote economic growth. The next section begins with some basic information on the data and on measurement issues.

2 Data

The information on start-ups and regional employment is from the establishment file of the German Social Insurance Statistics, as described and documented by Fritsch and Brixy (2004). This database provides information about all establishments that have at least one employee subject to obligatory social insurance. The data on West Germany are currently available on a yearly basis for a relatively long time period ranging from 1983 to 2002. Start-ups consisting of only owners are not included because the database records only businesses with at least one employee.

The analysis is restricted to West Germany because many studies indicate that the East German economy in the 1990s was a special case with very unique conditions that cannot be directly compared to those of West Germany (Brixy and Grotz 2004; Fritsch 2004). The Berlin region was also excluded due to changes in the definition of that region during the time period under inspection. Furthermore, the spatial framework is on the level of planning regions. The advantage of using planning regions instead of districts is that these regions include at least one core city as well as its surroundings. The spatial concept of planning regions focuses on commuter distances, therefore they account for travel to work areas and provide a better representation of functional spatial economic entities than districts.²

² 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 are only of limited significance for an interregional comparison since it does not account for the economic potentials of these regions. In order to judge if the regional level of start-up activity is relatively high or relatively low compared to other regions, we calculate start-up rates. There are a number of alternative ways to calculate such a start-up rate (Audretsch and Fritsch 1994). Start-up rates are estimated according to the labor market approach, which divides the number of start-ups per period by the number of persons in the regional workforce at the beginning of the respective period including unemployed individuals. 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 paid-employees or to start their own venture.

Considering the fact that start-ups are usually located close to the founder's residence (Gudgin 1978; Mueller and Morgan 1962; Cooper and Dunkelberg 1987; Sorenson and Audia 2000), 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. The data set allows investigating regional development over a long time period. Therefore, path-dependency can be analyzed and the empirical investigation accounts for unobserved region-specific effects by employing the fixed-effects estimator.

3 The development of new business formation 1983–2002

According to the data, about 2.64 million new businesses in the private sector were founded between 1983 and 2002. On average, there were 126,000 start-ups 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 1999.³ On average about 132,000 new businesses were set up between 1990 and 1997, an increase of 12%. The 1998–2002 period is dominated by an extremely high number of new businesses in 1999 and 2000 leading to an average number of 153,500 start-ups per year. Overall, about 74% of all start-ups were in the service sector compared to about 11% of all start-ups in manufacturing and 15% in the remaining private sector (e.g. agriculture and forestry, fishery, energy and water supply, mining, and construction).

There was an overall trend towards an increasing share of start-ups in the service sector and a corresponding decreasing share in manufacturing (Fig. 1). In the service sector, the largest number of new establishments was set up in wholesale and resale trade, hotels, and in the non-specified other services. In manufacturing, most start-ups were in sectors such as electrical engineering, furniture, and food.

³ 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.

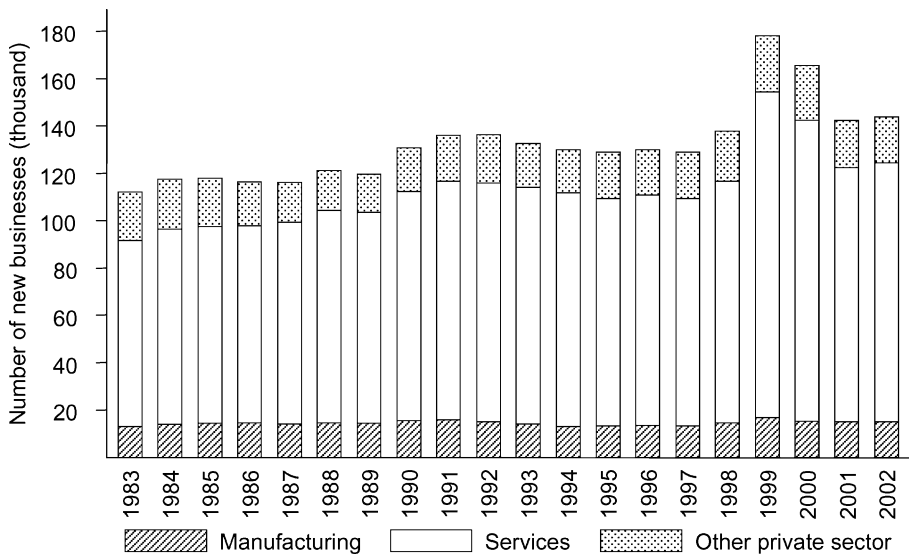


Fig. 1 Number of start-ups per year in West Germany 1983–2002

Most of the start-ups between 1983 and 2002 (about 56%) were located in the densely populated agglomerations, while 32% were in moderately congested regions, and only 11% were in rural areas. This distribution corresponds to the distribution of employees and incumbent businesses; about 54% of the incumbent businesses and 57% of the employees are located in the agglomerations.

There is a large variation between start-up rates over space (Fig. 2). While some regions had less than four new businesses per 1,000 persons in the workforce, 50% of the regions had less than seven new businesses per workforce and only 5% had a start-up rate of more than 10. The maximum start-up rate amounted to a little more than 14 new businesses per 1,000 persons in the workforce. The development of new business formation activity was rather steady not only in West Germany as a whole but also on the regional level (Fig. 2). Start-up rates (number of new businesses per 1,000 persons in the workforce) are used to be able to draw comparisons between the different planning regions. The analysis demonstrates a rather high correlation between regional start-up rates in different years as well as a great degree of variation between the regions (Fig. 2). In most cases, the correlation coefficient of start-up rates in subsequent years assumes values between 0.96 and 0.98. The relationship is not as close for years that are farther apart, but even over a 10, 15, and 19 year period the value of the correlation coefficient always remains above 0.8 (Table 5 in the Appendix). There is some slight variation with regard to the closeness of the relationship between the different years, but the basic pattern is remarkably constant.

Running pooled regressions with the start-up rate as a dependent variable and the start-up rates of previous years as independent variables, the impact of the past start-up rates decline with increasing time distance (Table 1). However, the high values of the adjusted R^2 suggest that a large part of the variation of regional start-up rates can be explained by previous start-up activity. Obviously, new business formation activity is

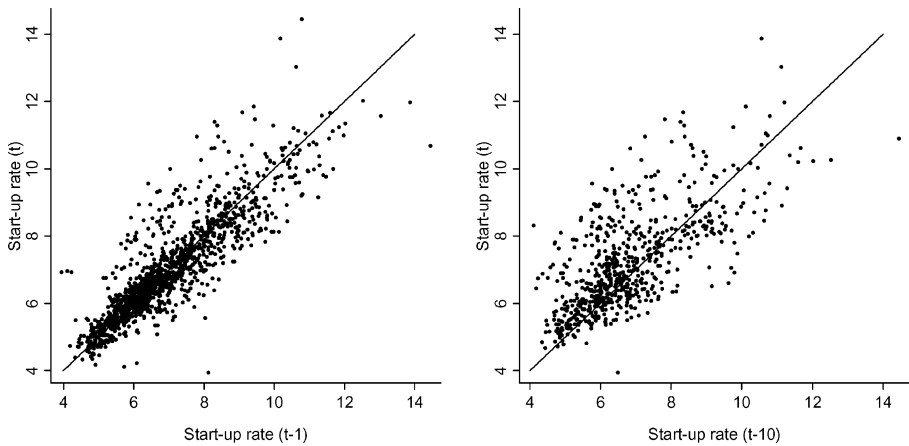


Fig. 2 Relationship between start-up rates in subsequent years (t and $t-1$) and over a 10 year period (t and $t-10$)

rather persistent over time—on the national and on a regional level. There is evidence that more than 50% of the variance of start-up rates can be attributed to the start-up rate that prevailed 15 years ago (model VII in Table 1). This indicates that regional new business formation activity is highly path-dependent, and that the effect of this path-dependency probably lasts over a longer time period than the observed period.

The variation of start-ups, workforce, and the regional start-up rates is much more distinctive between the regions than within the regions (Table 2). The average variation coefficient of the number of start-ups within the regions is almost twice as

Table 1 Persistence of new business formation activity

	Start-up rate (t)						
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
Start-up rate ($t-1$)	0.900 ^a (73.13)	–	–	–	–	–	–
Start-up rate ($t-2$)	–	0.881 ^a (64.03)	–	–	–	–	–
Start-up rate ($t-3$)	–	–	0.885 ^a (63.14)	–	–	–	–
Start-up rate ($t-4$)	–	–	–	0.861 ^a (54.37)	–	–	–
Start-up rate ($t-5$)	–	–	–	–	0.842 ^a (48.44)	–	–
Start-up rate ($t-10$)	–	–	–	–	–	0.778 ^a (30.12)	–
Start-up rate ($t-15$)	–	–	–	–	–	–	0.756 ^a (17.13)
R^2 -adjusted	0.8097	0.7760	0.7823	0.7406	0.7094	0.6053	0.5694
F -Value	5,348.63	4,099.29	3,986.33	2,955.96	2,346.41	907.51	293.28
Number of observations	1,258	1,184	1,110	1,036	962	592	222

Year 1999 excluded because of extreme values.

Beta coefficients

^a statistically significant at 1%-level

Table 2 Variation of new business formation activity (1984–2002)

		Mean	Standard deviation	Coefficient of variation over all regions
Start-up rate	overall	6.97	1.49	0.21
	between regions		1.31	0.20
	within regions		0.74	0.11 ^a
Number of start-ups	overall	1,798.79	1,464.78	0.81
	between regions		1,443.45	0.80
	within regions		297.86	0.13 ^a
Workforce (number of employees and of unemployed)	overall	267,839.60	222,433.80	0.83
	between regions		222,778.80	0.83
	within regions		21,960.62	0.07 ^a

^a Mean of regional values

high as the variation coefficient of the number of individuals in the workforce. This indicates that changes in regional start-up rates are more likely caused by changes in the number of new businesses and are less likely caused by changes of the regional workforce.

4 Determinants of new business formation

An empirical analysis of the factors that determine new business formation can provide indications for policy measures that might be suited to influence regional start-up activity. In order to analyze and discuss possible policy measures two different types of analysis were conducted. First, the focus is on the determinants of the level of regional new business formation (section 4.1). This analysis serves as a basis for identifying those factors that determine changes in regional start-up rates (section 4.2). Considering that the investigation is limited to the regions of a single country, it naturally neglects those determinants that do not vary much among regions such as the national tax policy or the welfare system.

4.1 Determinants of regional new business formation

It is a key hypothesis in the literature that new business formation is closely linked to innovation activity and structural change. Particularly, the qualification of the regional workforce and small firm employment may have a pronounced effect on the level of new business start-ups (see Fritsch and Falck 2007; Armington and Acs 2002; Reynolds et al. 1994, for an overview). The following variables have been included into the empirical model in order to analyze their impact on the level of regional start-up activity:

- *Entrepreneurial climate*. Not only small but especially small and young firms can be regarded as seedbeds for future entrepreneurs (Wagner 2004). Recent empirical studies have shown that employees in establishments which are small or small and young have a considerably higher propensity to start their business than employees in older and in larger establishments (Beesley and Hamilton 1984; Wagner 2004; Mueller 2006). According to Wagner (2004), the

combination of both—being a small and young firm—specifically promotes a pro-entrepreneurial attitude. A reason may be that employees in small firms have relatively good possibility of direct contact with the business' founder who may serve as a role model of an entrepreneur. This effect can be particularly pronounced for younger firms in which employees witness the problems and practical solutions involved in establishing a new venture. Furthermore, a high proportion of employment in small firms may also indicate a low minimum efficient size which can be assumed favorable for entry (Fritsch and Falck 2007). The share of employees working in small and young businesses is used as a proxy for the entrepreneurial climate in the respective region. Businesses were classified as small and young when they had less than 20 employees at the time of their founding and were no more than three years old (source: Social Insurance Statistics).

- *Innovation activity.* Knowledge and ideas are important sources for new business formation. Especially innovative start-ups are more likely to occur in regions that are characterized by a high level of knowledge and innovative activity. Prior knowledge and experience can be regarded as key determinants of the propensity of an individual to set up a business in innovative sectors (Sorenson and Audia 2000; Klepper and Sleeper 2005; Agarwal et al. 2004; Shane 2000; Wagner 2004; Shepherd and DeTienne 2005). The regional share of R&D personnel is used as a proxy for innovative activity and measures the regional knowledge stock. Employees are classified as working in R&D if they have a tertiary degree in engineering or natural sciences (source: Social Insurance Statistics).
- *Agglomeration.* Regions with a high density of population and economic activity may have higher start-up rates than rural areas due to better access to large and differentiated markets for input factors such as capital, labor, and services. Moreover, firms located in agglomerations can be assumed to be more exposed to knowledge spillover of academic institutions and research conducted by other firms in the region. However, the costs of starting a business such as wages and rent for office space are usually higher in a high-density agglomeration than in rural areas. Although, agglomerations provide a large local output market, there can also be a larger number of local suppliers which cause a more intense competition in these markets. Population density is used as a variable to capture these effects (source: Federal Statistical Office).
- *Demand.* New business formation can be driven or restricted by demand. Regional gross value added per workforce is used here as an indicator for the level of demand and welfare. The percentage change of the regional gross value added measures the development of demand (source: Federal Statistical Office).
- *Unemployment.* Regional unemployment may affect the level of start-up activity in different ways. On the one hand, unemployed persons face rather low opportunity costs when setting up an own business with no other prospects for employment; hence, a high level of unemployment may force individuals to start a business. On the other hand, high unemployment may indicate relatively low demand and correspondingly bad prospects for a successful start-up. Moreover, unemployed persons may have only little capital of their own and, therefore, also limited access to external finance sources. In most of the empirical studies,

the impact of the unemployment rate on new business formation was found to be weakly significant or insignificant (Armington and Acs 2002; Reynolds et al. 1994; Geroski 1995). A few analyses have found that the change in the number of unemployed had a negative impact on new business formation activity (Reynolds et al. 1994; Sutaria 2001; Sutaria and Hicks 2004). Evidence on the micro-level suggests that unemployed individuals have a higher propensity to be a nascent entrepreneur than people in employment (Wagner and Sternberg 2004). Data on the regional unemployment rate were provided by the Federal Employment Services.

In addition to these variables, the past start-up rate is included in order to analyze the path-dependency of new business formation activity. Indicators for the formal qualification level of the regional workforce such as the share of employed persons with a university degree showed a high correlation with the share of R&D employment.⁴ Consequently, this variable was not included in the models in order to avoid multicollinearity problems. Measurements for the regional welfare level such as gross value added per capita have also not been included together with the regional unemployment rate due to their close statistical relationship. Indicators for the sectoral structure of the regional economy (e.g., the share of employment in services) showed high correlation with the share of employees in young and small businesses as well as with population density. These latter variables have been preferred for the analysis because they appeared to provide a much better representation of the relevant effects rather than measures of the sectoral structure.

This paper analyzes the level of new business formation in the overall private sector. Both, the dependent and independent variables are defined per year. The value of the start-up rate is left-censored since the start-up rate cannot assume a value of less than zero. Therefore, a Tobit regression may be the appropriate method of analysis. The results of Tobit regressions hardly differed from the OLS regressions, therefore, only the results of OLS regressions are presented.⁵ All models have been estimated as pooled regression as well as by fixed-effects panel regression. An advantage of fixed-effects regression over pooled regression is that it accounts for the unobserved region specific effects. A severe disadvantage of the fixed-effects estimator may be that some variables such as population density tend to be rather time-invariant. Therefore, the influence of such variables is included into the region specific fixed effect and not attributed to the respective variable. Both estimation methods lead to different policy implications. The results of the fixed-effects regressions indicate the main determinants of new business formation independent of specific characteristics of a region. Therefore, if a policy is targeting an increase of the number of start-ups per se, the results of the fixed-effects regressions may be regarded as being more relevant. The pooled regressions point to those factors that may be responsible for the level of new business formation as compared to other regions. Accordingly, the results of pooled regressions may be particularly relevant for

⁴ This high correlation is in no way surprising since R&D employment according to our definition—personnel with a tertiary degree in engineering and in natural sciences—constitutes a subgroup of the employed persons with a university degree.

⁵ The results of the Tobit regressions are available from the authors upon request.

a policy that aims at raising the level of new business formation relative to other regions. In order to avoid causality problems, the exogenous variables are lagged 1 year.⁶ The past start-up rate is lagged 5 years. The change of gross value added relates to the previous 5 year period. All models control for spatial autocorrelation by including the mean value of the residual in the adjacent regions. The highly significant coefficients for this variable indicate the presence of positive neighborhood effects of new business formation in adjacent regions. However, the estimates hardly differed if this control variable was not included in the models.

The estimations of the determinants of new business formation activity in the overall private sector largely confirm the expectations (Table 3). The main determinants of regional new business formation are the entrepreneurial climate in a region and innovation activity. The pooled regressions as well as the fixed-effects models prove that innovation activity is conducive for new business formation. This indicates a crucial role of R&D activities for the regional knowledge stock and the creation of entrepreneurial opportunities. According to the estimates, the share of employees in small and young businesses has a highly significant stimulating effect on regional start-up activity. Due to the fact that employment in small and young businesses is considerably affected by the level of start-ups in previous periods, the indicator also reflects the persistence of past regional new business formation activity. This may explain why the coefficient for the lagged start-up rate is much smaller in the pooled regressions, which include the share of employment in small and young businesses. The high correlation between the current and the lagged start-up rate is obviously the reason why the past start-up rate is not statistically significant in the fixed-effects regressions. Presumably, the effect of path-dependency is included into the fixed-effects here. For the same reason, the coefficients of the employment share in small and young businesses are considerably smaller in the fixed-effects regression as compared to the estimates of the pooled regression. The impact of population density is negative in the pooled regressions indicating relatively unfavorable conditions for start-ups in agglomerated areas. The fact that the coefficient for population density is non-significant in the fixed-effects estimates is probably due to the minimal amount of changes of the value of this variable over the observation period. Therefore, the impact of population density is probably included into the fixed effects.

Due to multicollinearity problems gross value added per workforce, change of gross value added, and the regional unemployment rate are not included in the same model. The positive coefficient for the level of gross value added per workforce suggests that a high level of local wealth or demand is conducive for regional start-up activity. However, the results of the pooled regression and fixed-effects regression for the change of gross value added as well as for the regional unemployment rate are contradicting. According to the pooled regression estimates, a relatively pronounced increase of gross value added as well as low unemployment rates go along with higher regional start-up rates. This result is consistent with other cross-regional studies of start-up activity (e.g. Audretsch and Fritsch 1994; Reynolds et al. 1994). Employing the

⁶ The differences as compared to models in which start-up rates and exogenous variables are for the same year are, however, negligible. This indicates that reversed causality (Granger 1969) does not appear to be a problem here.

Table 3 Determinants of new business formation

	Regional start-up rate							
	Pooled regression				Fixed-effects regression			
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Share R&D personnel (t-1)	-	0.073 ^b (3.62)	0.062 ^a (2.48)	0.032 (1.47)	-	0.969 ^b (9.36)	0.956 ^b (9.29)	0.957 ^b (9.33)
Share employees in small, young businesses (t-1)	-	0.369 ^b (20.90)	0.370 ^b (20.41)	0.470 ^b (20.96)	-	0.235 ^b (7.54)	0.215 ^b (6.93)	0.196 ^b (6.44)
Log population density (t-1)	-	-0.087 ^b (3.15)	-0.132 ^b (4.65)	-0.051 (1.78)	-	0.543 (0.66)	-0.564 (0.68)	0.126 (0.17)
Change of gross value added over 5 year period (t-5)	-	0.006 ^a (2.37)	-	-	-	-0.006 ^b (2.70)	-	-
Gross value added per workforce (t-1)	-	-	0.497 ^a (2.09)	-	-	-	0.809 ^a (2.19)	-
Unemployment rate (t-1)	-	-	-	-0.082 ^b (8.08)	-	-	-	0.213 ^b (10.27)
Start-up rate (t-5)	-	0.803 ^b (67.61)	0.549 ^b (30.51)	0.464 ^b (22.00)	-0.037 (1.28)	-0.041 (1.26)	-0.043 (1.34)	-0.017 (0.52)
Spatial lag (error)	-	0.936 ^b (48.46)	0.965 ^b (49.06)	0.958 ^b (48.76)	0.966 ^b (57.98)	0.962 ^b (51.44)	0.959 ^b (51.98)	0.957 ^b (50.55)
Constant	-	1.665 ^b (20.47)	1.028 ^b (5.69)	-4.294 (1.64)	1.486 ^b (8.99)	7.289 ^b (37.27)	0.686 (0.16)	-2.365 (0.52)
R ² -adjusted	0.8860	0.9057	0.9032	0.9070	0.7900	0.7914	0.7936	0.7934
F-value	3,447.77	1,420.34	1,379.87	1,442.93	1,705.61	573.88	581.73	580.73
Number of observations	888	888	888	888	888	888	888	888

t-values in parentheses

^a significant at 5%-level^b significant at 1%-level

fixed-effects method, however, the results show a reversed sign for both variables. The results of the fixed-effects regressions suggest that regions with a high growth rate of gross value added had a low start-up rate. Furthermore, in those periods where regions experienced relatively high unemployment rates they had a higher rate of new business formation activity. Specifically, a detailed analysis showed those regions with relatively high start-up rates in the year 2002 also experienced a relatively pronounced increase of unemployment over the ten preceding years.⁷

The analysis of regional start-up rates reveals a high degree of path-dependency as well as a considerable influence of innovation activity. The highly significant coefficients of the past entry rates and the employment shares in small and young businesses clearly indicate the role of a long-lasting entrepreneurial spirit in a region. Compared to these influences the effect of unemployment, local demand change, and population density appears to be of only minor importance.

4.2 Why do changes of regional start-up activity occur?

In order to analyze the factors that determine changes of regional new business formation activity, the percentage change of the number of start-ups is used as the dependent variable. The analysis focuses on the long-term development instead of short-term fluctuations. Therefore, the change rate over a period of five years is employed. The explanatory variables were the changes (percentage) of R&D employees and employees in small and young businesses over the previous five year period. In addition, the share of R&D employment as well as the share of employment in small and young businesses is included into the regression. Population density controls for agglomeration economies and other regional characteristics. Gross value added per labor force reflects the regional wealth level and the lagged start-up rate gives the level of new business formation activity. Model II and IV also contain the change rate of gross value added in the previous 5-year period in order to test for the effect of demand on the level of start-ups. Due to the already mentioned correlation between change of regional demand and the unemployment rate, both variables should not be included into the same model. If the models include the unemployment rate instead of the change of gross value added, the coefficient for the unemployment rate is positive. This indicates that high unemployment may force individuals into ‘necessity entrepreneurship,’ i.e., establishing their own business due to lack of prospects of attaining a paid position (Minitti et al. 2006: 12).⁸ Since promoting unemployment is not a meaningful strategy of a policy that aims at raising the level of start-ups in order to stimulate the generation of new jobs, the unemployment rate is not included into the models in Table 4. As in the models for the level of regional start-

⁷ Applying a multi-dimensional approach that accounts for region-specific fixed effects, Fritsch and Falck (2007) found a positive relationship between the regional level of start-ups in the service sector and the share of persons which were unemployed for less than 1 year in the regional workforce. For start-ups in manufacturing, the short-term unemployment was not statistically significant. The share of people in unemployment for more than one year had no effect on new business formation activity.

⁸ One may suspect that in regions with high unemployment a relatively large part of the start-ups has to be regarded as necessity entrepreneurship. However, since our data contain only start-ups with at least one employee subject to social insurance payments, sole self-employment firms which make a large part of the necessity entrepreneurship are not included.

Table 4 Determinants of changes of the number of start-ups

	Percent change of number of start-ups			
	Pooled regression		Panel fixed effects regression	
	(I)	(II)	(III)	(IV)
R&D personnel (change over 5 years, %)	0.133 ^b (4.62)	0.135 ^b (4.80)	0.118 ^b (2.80)	0.077 (1.75)
Employees in small young firms (change over 5 years, %)	0.208 ^b (7.16)	0.223 ^b (7.86)	0.272 ^b (6.50)	0.207 ^b (4.90)
Share of R&D personnel (t-1)	0.006 (1.49)	0.009 ^b (2.89)	0.165 ^b (6.00)	0.165 ^b (5.81)
Share of employees in small and young firms (t-1)	0.035 ^b (10.11)	0.032 ^b (9.02)	0.028 ^b (3.04)	0.027 ^b (2.92)
Log population density (t-1)	-0.031 ^b (6.47)	-0.023 ^b (4.88)	-0.342 (1.09)	0.633 ^a (2.13)
Log gross value added per labor force (t-5)	0.140 ^b (3.62)	-	0.303 ^b (4.06)	-
Change gross value added over 5 year period (t-5)	-	-0.001 (1.27)	-	-0.006 ^b (8.33)
Start-up rate (t-5)	-0.048 ^b (13.84)	-0.044 ^b (12.63)	-0.141 ^b (20.20)	-0.141 ^b (19.60)
Spatial lag (error)	1.029 ^b (39.95)	1.051 ^b (41.05)	1.067 ^b (31.26)	1.067 ^b (26.54)
Constant	-1.308 ^b (3.08)	0.226 ^b (6.82)	-1.146 (0.73)	-2.942 (1.82)
R ² -adjusted	0.8023	0.8073	0.7918	0.7809
F-value	300.87	310.55	291.02	273.48
Number of observations	592	592	592	592

t-values in parentheses

^a significant at 5%-level

^b significant at 1%-level

ups (Table 3), we control for spatial autocorrelation by including the mean residual of the adjacent regions. Again, all models are estimated by pooled regression and by applying a fixed-effects estimator.

As in the analyses for the level of start-ups, the level of R&D employment and the level of employment in small and young businesses have a positive effect on an increase of regional new business formation activity (Table 4). Apparently, high levels of regional innovation and entrepreneurship fuel new business formation processes. This can also be observed for an increase of R&D employment and an increase of employment in small and young businesses. 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 instead of increase in the next period. While population density has a statistically significant negative effect on the development of the start-up rate, the coefficient for gross value added per labor force shows a positive sign indicating that a high regional wealth level may stimulate start-ups. The impact of changes of gross value added is non-significant or significantly negative. Obviously, an increase in regional demand hardly affects an increase in start-up activity.

The results of fixed-effects and pooled regression show a high degree of correspondence. Based on these estimates, it can be concluded 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 an increase in start-up activity are regional innovativeness and the already existing level of entrepreneurship. A high regional level of unemployment may also force

more individuals to start a business and lead to an increase in start-ups. A change in gross value added does not prove 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.

5 Discussion and policy implications

There are great differences between regional start-up rates, and it is quite likely that these differences have considerable consequences for regional development, particularly in the long run. The level of regional new business formation activity shows a pronounced degree of persistence and path-dependency over time. Regions with relatively high entry-rates in the past are most likely to experience high level of start-up activity in the future. Correspondingly, regions with a low level of new businesses today are 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 a long time period, 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 the 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.⁹

The analyses of the factors that determine the level and the development of regional new business formation clearly indicate a strong influence of the entrepreneurial culture and the level of innovation activity in a region. These two issues constitute the main starting points for a policy, which aims to enhance new businesses formation in certain regions. Having identified these two fields of action the question arises how the entrepreneurial culture and the level of innovation activity could be appropriately stimulated. What is the scope and what are the right measures for such a policy? There are no ready answers to such questions. It is well known, however, that regions are rather different and that different regional growth regimes may be identified (Audretsch and Fritsch 2002; Fritsch 2004; Fritsch and Mueller 2005, 2006) in which the level as well as the character of entrepreneurship may differ considerably (see contributions in Fritsch and Schmude, 2006). This suggests that development strategies and policy measures should account for region-specific factors.¹⁰ Despite the fact that entrepreneurship is strongly shaped by regional characteristics, one should acknowledge that a number of factors, which

⁹ Perhaps, this conclusion should be qualified by pointing out that the effects of public policy programs, that are aiming at promoting start-ups in certain regions, were not investigated. Therefore, the finding that changes of the regional level of new business formation activity are small and slow should not be misconceived as an evaluation of the effectiveness of such policies. There were quite a number of such policies in operation in the period under review on the national level as well as in a number of regions. Obviously, these policies did not lead to any quick and large changes of the level of new business formation activity.

¹⁰ For a more detailed discussion with regard to entrepreneurship policy see Lundstroem and Stevenson (2005). Howells (2005) and Toedtling and Trippel (2005) demonstrate this rather clearly for the case of innovation policy.

may have a significant impact on the level of entrepreneurial activity, are mainly decided on the national level, consequently they hardly differ between regions (Audretsch et al. 2002). The issues stimulating or hampering 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).

A discussion of possible policy measures for promoting entrepreneurship and start-ups should not solely focus on the quantity of start-up but also account for their quality. Obviously, a maximization of the number of start-ups is not a meaningful strategy (Greene et al. 2004). Moreover, policy should not neglect that large businesses could make a significant contribution to regional development. Innovative incumbent firms may serve as an incubator of new businesses by providing a seedbed for spin-offs (Klepper and Sleeper 2005; Agarwal et al. 2004; Klepper 2001; Sorenson 2003). It may, indeed, be crucial for regional development to have a balanced combination of both small businesses and incumbent enterprises. Nevertheless, it is still rather unclear how such a policy can be put into practice. Therefore, considerable further research regarding appropriate entrepreneurship policy is necessary to develop appropriate strategies. If entrepreneurship capital is an important determinant for growth, it is necessary to learn more about ways in which it can be created.

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Appendix

Table 5 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	
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	0.92	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	0.93	0.95	0.96	0.95	0.95	0.96	1.00					
1998	0.91	0.89	0.88	0.90	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	0.92

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

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