Start-ups, New Business Employment, and the Effects on Incumbents: Who Contributes the Larger Share?

Michael Fritsch

Florian Noseleit

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Abstract

We investigate the effects that new business formation has on employment in incumbent firms and compare it to the development in the start-ups. The analysis is performed for West German regions over the 1984-2002 period. It shows that the employment effects of new businesses on the incumbents are significantly positive. Moreover, we find indication that these effects on imcumbents are considerably larger than the employment that is directly generated in the start-ups. We draw conclusions for policy and for further research.

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Address for correspondence:

Prof. Dr. Michael Fritsch
Florian Noseleit
Friedrich Schiller University Jena
School of Economics and Business Administration
Carl-Zeiss-Str. 3
D-07743 Jena
Phone: (03641) 943 – 220 (Fritsch), - 226 (Noseleit)

m.fritsch@uni-jena.de
florian.noseleit@uni-jena.de

1. Aims and scope[1]

New businesses can contribute to employment growth in a number of ways. Most empirical analyses of the employment effects of start-ups have focused on the jobs that are generated in the new entities, what may be labeled their *direct effect*.[2] However, new business formation may also have several types of *indirect effects* on the incumbent businesses. One type of such an indirect effect is the displacement of incumbent suppliers by the newcomers. A second type of indirect effect is the improvement on the supply-side of the economy due to the additional competition exerted by the entries. These supply-side improvements raise the productivity of the economy and may induce higher competitiveness and more employment (Aghion et al., 2004, 2008; Disney, Haskell and Heden, 2003).[3]

While a number of studies have analyzed the direct employment effects of new business formation, i.e. their development over time, the indirect effects have remained largely unexplored. This paper tries to fill this gap by investigating these indirect effects. In particular, we test two hypotheses. The first of theses hypotheses is that the overall indirect employment effect of new business formation that results from the displacement of incumbents *and* from improvements of the supply-side is positive. This implies that the supply-side effects are considerably larger than the displacement effects. The second hypothesis states that the indirect effects of new business formation lead to more employment than what is created by the newcomers.

A relatively high importance of indirect effects of entry on employment has considerable implications for policy as well as for

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[1] We are indebted to Oliver Falck (Munich) and to Joachim Wagner (Lueneburg) for helpful comments on an earlier version of this paper.

[2] This type of research has been initiated by a study for the US by David Birch (1981) who claimed that new firms generate more jobs than incumbents.

[3] A third type of indirect effect results from the demand of the new entities for resources; see Fritsch and Noseleit (2008) for details.

further empirical investigations. If most of the employment that is induced by new businesses occurs in the incumbents empirical analyses should not solely focus on the jobs created by the newcomers as is the case in nearly all previous studies on the issue. Moreover, since the occurrence of positive supply-side effects requires a well working market mechanism policy should avoid any distortion of the market selection process, e.g. by subsidizing newcomers.

Our empirical analysis is based on data for West-German regions in the 1984-2002 period. We investigate the employment effects of new business formation at a regional level because an analysis at the level of industries leads to serious difficulties in the interpretation of the results. These difficulties result from the observation that industries may follow a life-cycle (Klepper, 1996). If this is the case, then the number of entries and the start-up rate will be relatively high in the early stages of the life-cycle when the industry is growing, and it will be relatively low in latter stages in which the industry declines. Obviously, the resulting positive correlation between the start-up rate and the development of industry employment in subsequent periods may be considerably shaped by the industry live-cycle and can not be unambiguously regarded as an effect of entry on development. And, indeed, entirely different results are found if, for example, the relationship between the level of start-ups and subsequent employment change is analyzed on the level of regions and on the level of industries (see Fritsch, 1996). Therefore, geographical units of observation are much better suited for such an analysis than industries.

The following section (section 2) reviews recent research on the influence of new business formation on employment and explains the direct and the indirect effects in more detail. In section 3 we derive the measures for employment effects in new businesses and in the incumbents. A description of the data and of the spatial framework of the analysis follows in section 4. Section 5 provides an overview on the relative importance of employment change in new businesses and in incumbents followed by the in-depth empirical analysis of the different

effects (section 6). The final section (section 7) draws conclusions for empirical analyses as well as for public policy.

2. Direct and indirect effects of new business formation on regional employment change

New businesses represent an entry of new capacities into the market. By challenging the incumbent firms the newcomers are subject to the process of market selection. Due to competition and market selection, only a fraction of the start-ups survive for a longer period of time (Boeri and Cramer, 1992; Wagner 1994; Fritsch and Weyh, 2006), and those which do succeed in establishing in the market may displace incumbents. Given that market selection works according to a survival of the fittest scenario, firms with relatively high productivity will remain in the market while those with a low productivity have to reduce their output or are forced to exit. At a constant output level, this market selection process should lead to a decline in employment, not to an increase, because with a higher productivity fewer resources are needed for producing a given amount of goods and services. Hence, although starting a new business means creating extra capacities that require additional personnel to operate them, the effect of new business formation on the number of jobs in the economy does not necessarily need to be positive, but could just as well be negative.

However, a well-functioning market process is in no way a zero-sum game in which the gains of one actor are necessarily completely at the expense of the other actors. There are several ways in which competition by entry of new businesses can stimulate employment growth on the supply-side of the market. The main supply-side effects of entry could be (see Fritsch, 2008, for a more detailed review):

- *Securing efficiency and stimulating productivity increase* by contesting established market positions;
- *Acceleration of structural change*;
- *Amplified innovation*, particularly the creation of new markets;

- *Greater variety* of products and problem solutions[4].

The displacement effects as well as the supply-side effects are rather indirect in character. Displacement effects may occur on the output markets as well as on the input markets and are, therefore, not necessarily limited to the industry to which the start-ups belong. Also the supply-side effects can occur in completely different industries if the improved products are used as an input there. It is important to note that a considerable part of the indirect effects may occur in establishments which are located in other regions or countries. Therefore, the size of the indirect effects is probably underestimated when focusing solely on the development in the region or country where the start-ups occurred. With a market selection process that works according to a survival of the fittest scenario the direct employment effect and the displacement effects, taken together, will probably lead to employment decline. Therefore, it is the *indirect supply-side effects* which can be supposed to be the drivers of competitiveness in the respective region that may lead to employment growth. They are the main reason why the formation of new businesses should induce more employment.

The emergence of positive supply-side effects of new business formation does not necessarily require the newcomers to be successful and to survive. As long as entry induces improvements on the side of the incumbents, it will generate positive supply-side effects, even if most of the new businesses fail and have to exit the market soon after entry. Therefore, even the failed start-ups may make a significant contribution to the improvement of supply and competitiveness. This also shows that the development of the start-ups, the direct effect of entries, tells only a part of the whole story.

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[4] Such an increased variety implies a higher probability of finding a supply with a better match for customer preferences. Increased variety due to new supplies may stimulate an intensified division of labor as well as follow-up innovation and can, therefore, generate significant impulses for economic development. For the relationship between variety and economic development see Saviotti and Pyka (2004).

Theses considerations lead to the first hypothesis that will be tested in this paper:

Hypothesis 1: *The overall effect of new business formation on employment in incumbent businesses is positive because the competitiveness-enhancing supply-side effects are larger than the displacement effects.*

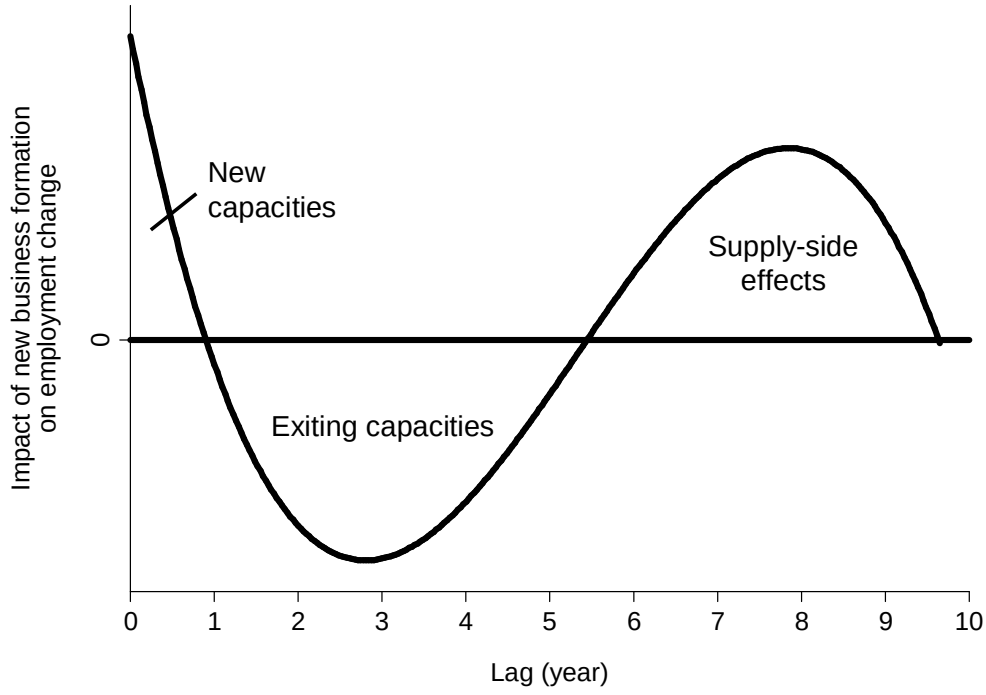

Figure 1: The effects of new firm formation on employment change over time – regression coefficients for start-up rates

Recent empirical studies for a number of countries[5] have shown that the effect of the emergence of new business on employment is spread over a period of about a decade (see Fritsch, 2008, for an overview). Including the start-up rates of the previous ten years into a regression for current employment change typically leads a 'wave'-

[5] Acs and Mueller (2008), Arauzo-Carod, Liviano-Solis and Martin-Bofarull (2008), Baptista, Escária and Madruga (2008), Carree and Thurik (2008), Fritsch and Mueller (2008), Mueller, van Stel and Storey (2008), van Stel and Suddle (2008).

pattern of the time-lag as shown in figure 1[6]. Typically, the first two years of this time period are characterized by increasing employment that is probably due to the dominance of the direct employment effects, i.e. the set-up of additional capacities. In the following three years (year three to year five after start-up) the development tends to be shaped by negative employment effects which suggest that during this phase the displacement of incumbents prevails. From about the sixth year on the effect becomes positive again what is presumably a result of supply-side improvements that have been induced by the newcomers.[7] After a period of about ten years, the relationship between new business formation and employment tends to become insignificant. Comparing the size of the effects as given by the wave-curve in figure 1 suggests that the employment change that the new businesses induce in the incumbent firms is larger, i.e., comprises a greater number of jobs, than the employment that is generated in the new businesses. Therefore, we attempt to test a second hypothesis:

Hypothesis 2: *The indirect employment effects of new business formation on the incumbents are larger than the employment generated by the newcomers.*

Confirmation of this hypothesis would clearly suggest that the development of the start-ups is relatively unimportant and that the priority of any policy towards new business formation should be to secure an effective and reliable market selection according to a survival of the fittest scenario.

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[6] This figure is based on the results of Fritsch and Mueller (2004).

[7] This positive employment effect that occurs after a period of about six years can not be explained by the development of the newcomers because employment in start-up cohorts tends to decline from the second year on and falls below the initial level after about eight years (see Boeri and Cramer, 1992, as well as Fritsch and Weyh, 2006, for details). This is shown by Fritsch and Noseleit (2008) who decompose this curve into the development of the new businesses and the development of the incumbents.

3. Definition of employment effects

The central purpose of our analysis is to compare the relative contribution of new businesses and incumbent firms to the overall development of employment. We, therefore, split the overall employment change (ΔEMP_{total}) into two components, the employment change in the newly founded businesses (ΔEMP_{new}) and the employment change in the incumbents (ΔEMP_{inc}), i.e.

$$(1) \qquad \Delta EMP_{total} = \Delta EMP_{inc} + \Delta EMP_{new} .$$

Using the information on total employment change (ΔEMP_{total}) and on employment in the new businesses (ΔEMP_{new}) we can calculate the employment change of the incumbents as

$$(2) \qquad \Delta EMP_{inc} = \Delta EMP_{total} - \Delta EMP_{new} .$$

This employment change of the incumbent businesses encompasses the indirect effects of the new businesses – displacement and supply-side effects – as well as other influences, which are not caused by the regional start-ups.

Since earlier studies (see Fritsch, 2008, for an overview) have shown that the effect of new businesses on employment evolves over a period of ten years, we determine the employment that the new businesses create directly by summing up the employment in the start-ups that occurred within the previous decade. Hence, the employment in the start-ups is defined as the number of employees in the start-up cohorts of the previous ten years. Start-ups which did not survive until year t=0 are not contained in this figure. For assessing the employment in the incumbents in a certain year, we subtract this direct effect, the employment in the start-ups of the previous ten years, from total employment. Therefore, the incumbent employment is the number of jobs in businesses which are at least ten years old.[8] The annually

[8] In the year t=0 incumbent employment is total employment in t=0 minus employment in the start-ups of the years t=0 to t-9 in year t=0. Incumbent employment in the year t-

change of total employment, employment in start-ups and of incumbent employment is then calculated as the average change over a two-year period, i.e., between the current period t=0 and t-2. A two-year average is used in order to avoid disturbances by short-term fluctuations. Employment change is expressed as relative change ($ln\ EMP_{t=0} - ln\ EMP_{t-2}$) in order to simplify interpretation and comparability.

For calculating the rate of employment change in incumbent businesses between t-2 and t=0 the underlying employment figures for the two years are in each case based on the same group of businesses. We thereby avoid the effect that employment change in incumbents is driven by businesses that have been classified as new businesses in t-2 and as incumbents in year t=0. The figure for employment change in new businesses is, however, affected by changes in the population of observations, because in t-2 the recent ten (t-2 to t-11) cohorts are included while the information on new business employment in t=0 is based on the recent twelve (t=0 to t-11) cohorts (table 1).

Table 1: Definition of direct and indirect employment effects of new businesses

Variable	*Definition*
Overall employment change	$\Delta EMP_{total} = ln\ EMP_{total\ t=0} - ln\ EMP_{total\ t-2}$
Employment in new businesses	$EMP_{new\ t=0}$ = *Employment in start-up cohorts of the years t-11 to t=0 in year t=0* $EMP_{new\ t-2}$ = *Employment in start-up cohorts of the years t-11 to t-2 in year t-2*
Weighted employment change in new businesses	$\Delta\ EMP_{new} = (\ln EMP_{new\ t=0} - \ln EMP_{new\ t-2}) \frac{(EMP_{new\ t=0} + EMP_{new\ t-2})/2}{(EMP_{total\ t=0} + EMP_{total\ t-2})/2}$
Employment in incumbents	$EMP_{inc\ t=0} = EMP_{total\ t=0} - EMP_{new\ t=0}$ $EMP_{inc\ t-2} = EMP_{total\ t-2} - EMP_{new\ t-2}$
Weighted employment change in incumbent businesses	$\Delta\ EMP_{inc} = (\ln EMP_{inc\ t=0} - \ln EMP_{inc\ t-2}) \frac{(EMP_{inc\ t=0} + EMP_{inc\ t-2})/2}{(EMP_{total\ t=0} + EMP_{total\ t-2})/2}$

2 is total employment in t-2 minus employment in the start-ups of the years t-2 to t-11 in year-2.

In the period for which we analyze employment change (1995-2002) the major share, on average 83.41 percent of total employment, was in incumbent businesses while 16.59 percent of employees worked in new businesses. This implies that overall employment change is mainly influenced by employment change in the incumbent businesses. Because we want to assess the contribution of young businesses and of the incumbents to overall employment change we weigh the percent employment change in these groups with their respective share of total employment. Due to this procedure, the weighted percent employment change in incumbents and in new businesses add up to total percent employment change. A simple example may illustrate the three employment change measures. Let total employment change be 3 percent. If the share of employees in businesses younger than 10 years is 20 percent, and the employment change in these young businesses is 10 percent, the respective employment change in businesses younger than 10 years is weighted by 0.2 resulting in 10 x 0.2 = 2 percent. In an analogous manner, the employment change of incumbents – in our example 1.25 percent – is also weighted by its share in total employment, 80 percent in our example. The weighted employment change of businesses older than 10 years is then 1.25 x 0.8 = 1 percent. Summing up the weighted employment change of incumbents and new businesses leads to 2 + 1 = 3 percent which is the total employment change. The relation between the weighted employment change in new businesses (incumbent businesses) and total employment change shows the relative contribution of both groups to regional employment. In our example the new businesses contribute ⅔ while ⅓ of the regional employment change can be attributed to the incumbents.[9] Table 1 displays the definitions of the different variables for the employment effects of new businesses.

[9] Example: In the Munich region total private employment change between the yers 1998 and 2000 was 8.4 percent. The unweighted employment change in businesses older than ten years (incumbents) was 3.1 percent. For business younger than ten years (new businesses) employment change was 30.6 percent, a considerable part of

Note that, according to these definitions, the employment change in new businesses may well be negative. It should also be noted that the employment in the start-up cohorts of the previous ten years also reflects indirect effects of new business formation since it is affected by competitors that have entered the market during this time-span. Such indirect effects have, however, to be disregarded in our approach.

4. Data and spatial framework of analysis

Our data on start-ups, employment in start-ups and on overall employment are derived from the establishment file of the German Social Insurance Statistics (*Betriebsdatei der Statistik der sozialversicherungspflichtig Beschäftigten*)[10]. This database allows to follow the employment in cohorts of newly founded businesses over time. The data is currently available for the *1984-2002* period. Other data are also taken from this source or are provided by the statistical offices.

The spatial framework of our analysis is based on the planning regions (*Raumordnungsregionen*) of West-Germany. Planning regions consist of at least one core city and the surrounding areas. Therefore, the advantage of planning regions in comparison to districts (*Kreise*) is that they can be regarded as functional units in the sense of travel to work areas thereby accounting for economic interactions between districts. Planning regions are slightly larger than what is usually defined

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which was due to the cohorts that entered that market between 1998 and 2000. The share of employees that worked in incumbent businesses over all employees for this period in the Munich region amounted to 80.6 percent. 19.4 percent of the employees worked in new businesses. Weighting the employment change in incumbent businesses by their employment share we get 3.1 x 0.806 = 2.5 percent. For new businesses the weighting procedure results in 30.6 x 0.194 = 5.9 percent. Adding up employment change of incumbents and employment change of new businesses we get 2.5 + 5.9 = 8.4 percent which is the total employment change. The contribution of new businesses to regional employment change was (5.9 : 8.4) * 100 = 70.2 percent; the share of the incumbents amounted to (2.5 : 8.4) * 100 = 29.8 percent.

[10] See Fritsch and Brixy (2004) for a description. This database includes information about all establishments that have at least one employee subject to obligatory social insurance – therefore only owner managed businesses without any other employees are excluded. The public sector is excluded from our analysis.

as a labor market area. In contrast to this, a district may be a single core city or a part of the surrounding suburban area (see Federal Office for Building and Regional Planning, 2003, for the definition of planning regions and districts).

We restrict the analysis to West Germany for two reasons. First, while data on start-ups for West Germany are currently available for the time period between 1984 and 2002, the time series for East Germany is much shorter beginning in the year 1993. Second, many analyses show that the developments in East Germany in the 1990s were heavily shaped by the transformation process to a market economy and, therefore, it represents a rather special case that should be analyzed separately (e.g., Fritsch, 2004; Kronthaler, 2005). The Berlin region had to be excluded due to changes in the definition of that region after the unification of Germany in 1990. For administrative reasons, the cities of Hamburg and Bremen are defined as planning regions even though they are not functional economic units. In order to avoid possible distortions, we merged these cities with adjacent planning regions[11]. Therefore, we have 71 regions in our sample.

5. Employment change in new and incumbent businesses across regions and over time

The mean value of total yearly employment change over all regions in the sample is slightly positive (0.117 percent) (table 2). However, the negative value for the median indicates that most of the regions (36 out of the 71 regions) suffered from a decline of overall employment in the period of analysis. The average employment change in incumbent businesses has a mean value of -2.84 percent. It was always negative except in two regions[12]. In contrast, employment change that can be

[11] Hamburg has been merged with the region of Schleswig-Holstein South and Hamburg-Umland-South. Bremen has been merged with Bremen-Umland.

[12] These regions are Ingolstadt and Landshut which are located north of Munich and can be regarded part of the greater Munich region. Ingolstadt is headquarter of the Audi car company.

directly attributed to new businesses is positive in all regions and the average value is much higher (2.96 percent) than for overall employment change. These figures indicate a considerable contribution of new businesses to regional employment growth. There is, however large variation of these growth rates across regions and over time. This variation is considerably more pronounced for the incumbents than for the new businesses (table 2).

Table 2: Descriptive statistics for regional employment change

Variable	*Mean*	*Median*	*Minimum*	*Maximum*	*Standard deviation*[a]
Total employment change (ΔEMP_{total})	.117	-0.004	-7.632	8.872	2.918 (1.389 / 2.571)
Weighted employment change in new businesses (ΔEMP_{new})	2.963	2.842	0.723	5.935	0.826 (0.433 / 0.706)
Weighted employment change in incumbents (ΔEMP_{inc})	-2.839	-2.871	-9.456	6.003	2.445 (1.246 / 2.109)

Note: All values are percentages.The number of observations is 568 for each of the variables. Values in parentheses display the between (first row; 71 regions) and the within (second row; 8 yearly observations) standard deviation.

Figure 2 displays the average regional values of total employment change, weighted employment change in incumbent businesses, and of the weighted employment change in new businesses over the period of analysis. We find rather close correspondence between the employment change in incumbents and overall employment change over time indicating that overall development of employment was largely shaped by the incumbents. The pattern for employment change in the new businesses is rather stable over time. This suggests that the overall development of employment is mainly due to changes in the incumbent businesses what may be a result of their much higher share in total employment.

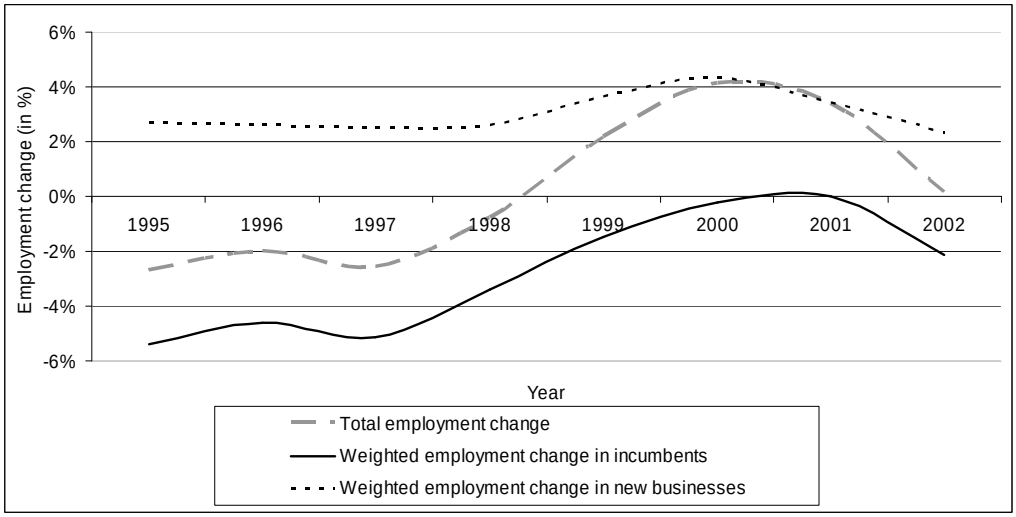

Figure 2: Average employment change in West German regions over time

As could have been expected from the relatively strong impact of incumbent employment on overall employment, we find that the regional distribution of employment change in incumbent businesses (figure 5) is quite similar to the regional distribution of total employment development (figure 3). The correlation coefficient between the average yearly change of total employment and of employment in incumbent businesses across regions is 0.96. Compared to this close statistical relationship the correlation between weighted employment change in new businesses and overall employment change is relatively low (0.67). It is even lower (0.47) for the relationship between the weighted employment change in new businesses and in the incumbents (see table A1in the appendix). Accordingly, the spatial distribution of the weighted employment change in new businesses (figure 4) diverges more pronounced from the pattern that is found for the change of overall and incumbent employment.

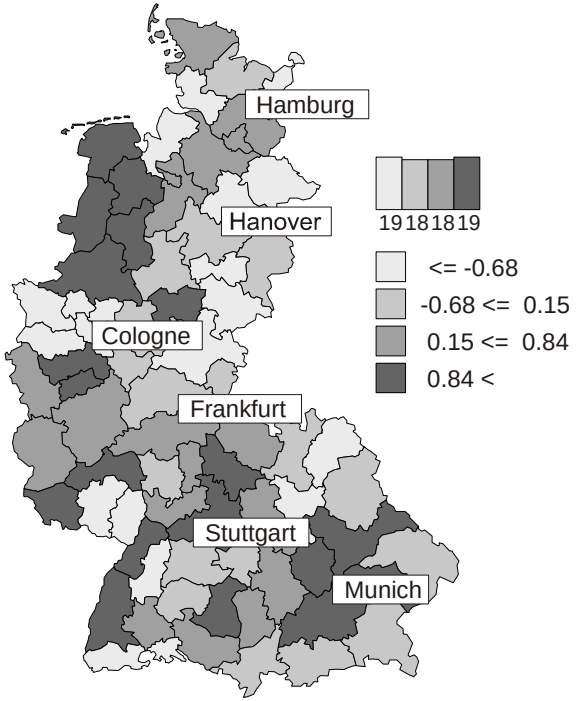

Figure 3: Spatial distribution of total employment change
(mean values 1995 – 2002)

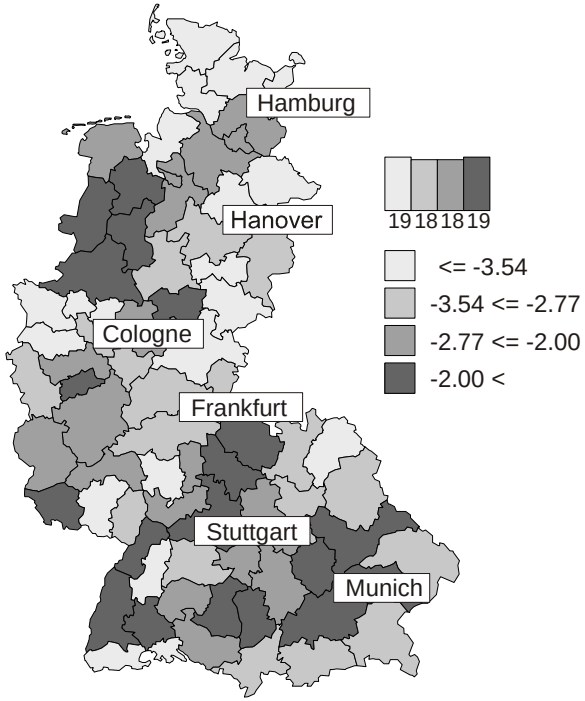

Figure 4: Spatial distribution of employment change of new businesses
(mean values 1995 – 2002)

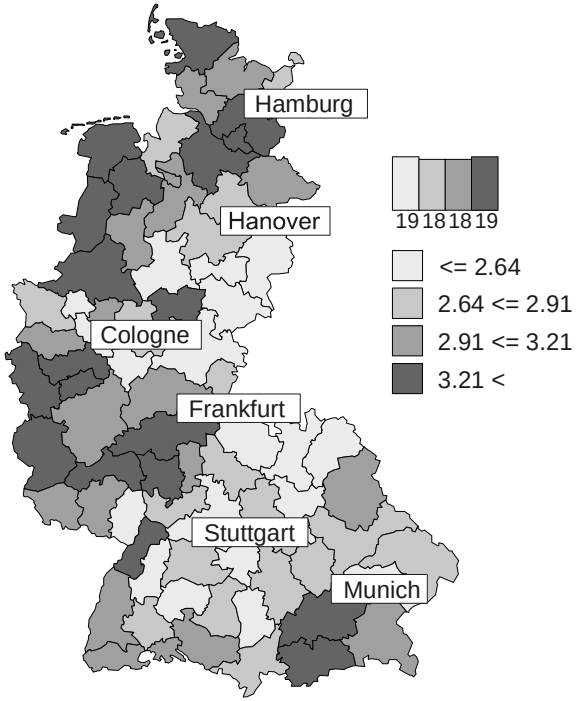

Figure 5: Spatial distribution of employment change of incumbent businesses (mean values 1995 – 2002)

There are pronounced differences in the employment change of new and the incumbent businesses between regions suggesting diverging roles of new and incumbent businesses in regional growth regimes (Audretsch and Fritsch, 2002; Fritsch 2004). However, these figures do not account for the indirect effects of new business formation on incumbent employment which will be analyzed in the next section.

6. New business formation and regional employment change in new and in incumbent businesses

6.1 Estimation approach

In analyzing the effect of new business formation on employment change in young and in incumbent businesses we regress the average start-up rate of the previous ten years on the different measures of employment change. Since both, the dependent and the independent variables are logarithmic values, the coefficients can be interpreted as quasi-elasticities, i.e. giving the average percentage change of employment due to a one percent change in the value of the respective independent variable.

The relationship between the measures of employment change and entrepreneurial activity is specified as

$$\Delta \ln EMP_{i,t} = \beta_0 + \beta_1 \ln \sum \text{start-up rate}_{i,t0-9} + \beta_3 Z_{i,t} + \upsilon_i + \varepsilon_{i,t}$$ where

$\Delta \ln EMP_{i,t}$ is the respective employment change (total / in incumbents / in new businesses). The average start-up rate ($ln\ \Sigma\ startuprate_{i,t0-9}$) is calculated over a period of ten years in order to account for the relevant time-lag that has been identified in previous analyses. Since the main interest of our analysis is to compare the effects of new business formation on employment in young businesses and in the incumbents the start-up rate is the key independent variable of our model. *Z* is a vector of further variables which may also have an influence on regional employment change. These variables are included in order to control for such effects.

We apply a Maximum Likelihood estimator with a spatial lag to control for neighbourhood effects. Although the regions of our analysis

can be regarded functional units we correct for possible spatial interactions. The applied neighboring matrix is based on the assumption that regional interactions are allowed at any time lag since empirical results have shown an intra-region lag of up to ten years for the impact of new businesses on regional employment change. In order to account for region specific fixed effects we include region dummies. A problem of the fixed-effects estimator may, however, be that the influence of variables which show only little variation over time is assigned to the fixed effects. In our model this may hold particularly for population density and, to some degree, also for the start-up rate.[13] The coefficients of other variables such as population density are only of minor importance in our analysis because these variables are included just to control for other influences.

6.2 Independent variables

The start-up rate is calculated according to the labor market approach; namely, the number of start-ups per period is divided by the number of persons in the regional workforce (in thousands) at the beginning of the respective period. An adjustment was made to control for the fact that not only the composition of industries differs considerably across regions, but that the relative importance of start-ups and incumbent enterprises also varies systematically across industries. This means that the relative importance of start-ups and incumbents in a region is confounded by the composition of industries in that region. This would result in a bias of overestimating the level of entrepreneurship in regions with a high composition of industries where start-ups play an

[13] The log values of the start-up rate have a standard deviation of 0.042 over time and of 0.123 between regions. This difference is not a severe problem because the between / within variance ratio is sufficiently small. However, the relatively low standard deviation of population density over time of 0.01 (0.66 across regions) indicates that parts of the influence of population density may be assigned to the fixed effects. This can lead to inefficient estimation and thus unreliable point estimates of this variable as well as to somewhat higher standard errors.

important role and underestimating the role of new business formation in regions with a high share of industries where the start-up rates are relatively low. To correct for the confounding effect of the regional composition of industries on the number of start-ups, a shift-share procedure was employed to obtain a sector-adjusted measure of start-up activity (see the Appendix of Audretsch and Fritsch, 2002, for details). This sector adjusted number of start-ups is defined as the number of new businesses in a region that could be expected if the composition of industries were identical across all regions. Thus, the measure adjusts the raw data by imposing the same composition of industries upon each region.[14]

In the models with total employment change and with the employment in newly founded businesses as dependent variable we expect a positive coefficient for the start-up rate. The coefficient of the start-up rate in models with employment change in the incumbent businesses indicates the direction and the magnitude of the indirect employment effects. If the indirect effects of new business formation on the incumbents is mainly a displacement of incumbents, the respective coefficient of the start-up rate should have a negative value. If positive supply-side effects prevail the coefficient of the start-up rate should be positive. Should the jobs in the newly founded businesses be the only contribution of start-ups to regional employment or if positive and negative indirect effects are of about the same magnitude, the coefficient can be expected to be non-significant. By comparing the coefficients for employment change in the start-ups and in the incumbents we can asses the relative magnitude of the direct and the indirect effects of new business formation.

We have tested a number of variables for which one could expect an impact on regional employment. Those variables which proved to be

[14] Our analysis shows that this procedure leads to somewhat clearer results and higher levels of determination than estimates with the non-adjusted start-up rate. However, the basic relationships are left unchanged.

statistically significant were included into the model in order to control for these influences. We found a significant effect on regional employment change for regional population density, for the regional level of labor productivity, the share of employees with a tertiary degree as well as for the share of employees in manufacturing.[15] Table 3 shows the definition of these variables and descriptive statistics are given in table 4. Correlation analysis shows that there is a significantly positive relationship between new business formation activities of the previous ten years and employment change of new businesses as well as employment change in incumbent businesses (table A1 in the appendix).

Table 3: Definition of independent variables and expected signs for their effect on regional employment change

Variable	*Definition*
Total employment change (ΔEMPtotal), spatial and temporal lag (ln)*	Mean of the employment change in region *i* and its neighboring regions.
Weighted employment change in new businesses (ΔEMPnew), spatial and temporal lag (ln)*	Mean of the weighted employment change in new businesses in region *i* and its neighboring regions.
Weighted employment change in incumbents (ΔEMPinc), spatial and temporal lag (ln)*	Mean of the weighted employment change in incumbent businesses in region *i* and its neighboring regions.
Average start-up rate of previous ten years (ln)	Average number of start-ups in a region over the regional workforce in the previous ten years (t=0 to t-9[a]
Population density, t-1 (ln)	Number of inhabitants in a region per square kilometer (log)[c]
Labor productivity, t-1 (ln)	Gross Value Added[c] per employee[a] in a region
Share of highly qualified employees, t-1 (ln)	Share of private industry employees in a region with tertiary education[a]
Share of manufacturing employees, t-1 (ln)	Share of private industry employees in the manufacturing sector in a region

a) Source: Social Insurance Statistics; b) Source: Federal Employment Services; c) Source: Federal Statistical Office

[15] Variables which have been tested and proved to be not statistically significant where the regional unemployment rate as well as different indicators for regional innovativeness such as the share of employees in Research and Development (R&D), the number of patents per employee or the share of R&D employment in small firms.

Table 4: Descriptive statistics for independent variables[a]

Variable	*Mean*	*Median*	*Minimum*	*Maximum*	*Standard deviation*
Total employment change (∆EMPtotal) (in %)	0.117	-0.004	-7.633	8.872	2.918
Weighted employment change in new businesses (∆EMPnew) (in %)	2.963	2.842	0.723	5.935	0.826
Weighted employment change in incumbents (∆EMPinc) (in %)	-2.839	-2.871	-9.456	6.003	2.445
Average start-up rate of previous ten years (t=0 to t-9) (ln)	2.198	2.211	1.857	2.556	0.129
Population density, t-1 (ln)	5.440	5.316	4.318	7.126	0.657
Labor productivity, t-1 (ln)	11.297	11.291	11.065	11.608	0.091
Share of highly qualified employees, t-1 (ln)	-3.199	-3.221	-4.269	-1.932	0.446
Share of manufacturing employees, t-1 (ln)	-1.121	-1.089	-1.766	-0.651	0.253

a) The number of observations is 568 for each of the variables. In the regression the percent employment change is expressed in values between -1 and +1.

6.3 Results

We find that the start-up rate has a significantly positive effect on overall employment as well as on employment in the new and in the incumbent businesses. The positive coefficient for employment change in the incumbents clearly indicates that the supply-side effects of new business formation outweigh their displacement effects, confirming our first hypothesis (see section 2). Comparing the estimated coefficients for the start-up rate in the models for employment change in incumbents with the coefficient in the respective model for employment change in the young businesses shows that the effect on employment change in the incumbents is considerably stronger than the employment change in the young businesses. This suggests that the indirect effects of new business formation on employment are considerably more pronounced than the employment development in the newly created entities which is in line with our second hypothesis.

Table 5: Effect of new businesses on total employment change, employment change in incumbents, and employment change in new businesses.

	Model I			Model II			Model III			Model IV			Model V		
	Employment change														
	overall	in incum-bents	in new busi-nesses	overall	in incum-bents	in new busi-nesses	overall	in incum-bents	in new busi-nesses	overall	in incum-bents	in new busi-nesses	overall	in incum-bents	in new busi-nesses
Average start-up rate of	0.275**	0.211**	0.0681**	0.263**	0.191**	0.0775**	0.309**	0.234**	0.0815**	0.243**	0.176**	0.0725**	0.237**	0.167**	0.0750**
previous ten years	(0.024)	(0.018)	(0.0088)	(0.024)	(0.019)	(0.0087)	(0.022)	(0.017)	(0.0080)	(0.024)	(0.018)	(0.0089)	(0.023)	(0.018)	(0.0088)
Population density, t-1	-0.0775	0.0409	-0.123**	-0.351**	-0.260**	-0.0919*	0.0269	0.112	-0.0857**	-0.334**	-0.245**	-0.0872*	-0.323**	-0.231*	-0.0913*
	(0.10)	(0.083)	(0.034)	(0.12)	(0.096)	(0.039)	(0.100)	(0.082)	(0.030)	(0.12)	(0.095)	(0.038)	(0.12)	(0.094)	(0.038)
Labor productivity, t-1	0.186**	0.171**	0.0172	–	–	–	–	–	–	0.109*	0.0850*	0.0279	0.107*	0.0822*	0.0288*
	(0.035)	(0.028)	(0.011)	–	–	–	–	–	–	(0.046)	(0.035)	(0.014)	(0.046)	(0.035)	(0.014)
Share of highly qualified	–	–	–	0.101**	0.103**	-0.00178	–	–	–	0.0701**	0.0785**	-0.0097	0.0596*	0.0638**	-0.00543
employees, t-1	–	–	–	(0.016)	(0.013)	(0.0048)	–	–	–	(0.021)	(0.017)	(0.0064)	(0.024)	(0.019)	(0.0070)
Share of manufacturing,	–	–	–	–	–	–	-0.135**	-0.150**	0.0157	–	–	–	-0.0468	-0.0656*	0.0191
t-1	–	–	–	–	–	–	(0.032)	(0.025)	(0.010)	–	–	–	(0.037)	(0.028)	(0.012)
Constant	-3.047**	-3.162**	0.0973	0.809	0.689	0.0989	-1.810**	-1.914**	0.0858	-0.552	-0.370	-0.249	-0.670	-0.537	-0.201
	(0.43)	(0.35)	(0.12)	(0.63)	(0.50)	(0.20)	(0.44)	(0.36)	(0.13)	(0.88)	(0.69)	(0.26)	(0.90)	(0.71)	(0.26)
rho (spatial lag)	0.0415**	0.0417**	-0.00487	0.0379*	0.0358**	-0.00465	0.0453**	0.0426**	-0.00471	0.0375*	0.0364**	-0.0052	0.0379*	0.0369**	-0.00524
	(0.015)	(0.012)	(0.0061)	(0.016)	(0.011)	(0.0062)	(0.016)	(0.012)	(0.0062)	(0.015)	(0.011)	(0.0062)	(0.015)	(0.011)	(0.0062)
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	568	568	568	568	568	568	568	568	568	568	568	568	568	568	568
Variance Ratio	0.56	0.61	0.39	0.56	0.62	0.39	0.54	0.60	0.39	0.57	0.63	0.40	0.57	0.63	0.40
Wald-test	7.23**	12.73**	0.63	5.88**	10.06**	0.56	7.88**	13.70**	0.57	6.01*	10.46**	0.71	6.15*	10.90**	0.72
LM-Test	4.56*	10.85**	0.58	3.87**	8.31**	0.53	5.23*	10.82**	0.54	3.84^{+}	8.78**	0.67	3.96*	9.06**	0.68
Log-likelihood	1434.68	1567.95	2060.39	1437.48	1578.61	2058.91	1425.07	1561.19	2060.09	1442.32	1583.41	2061.71	1443.31	1586.59	2063.16

Notes: robust standard errors in parentheses. $^{+}$ statistically significant at the 10 percent level; * statistically significant at the 5% percent level; ** statistically significant at the 1% level.

In order to illustrate the magnitude of the direct and indirect effects we use the estimated coefficients for calculating the respective number of jobs. We find that a one percent increase of the average ten-year regional start-up rate (this is a number of additional 17.5 new businesses per year for the average region) would increase regional employment in the new business by about 167 (Model I) to 199 (Model III) jobs. The indirect effect of such a one percent increase of the start-up rate on incumbent employment is, however, considerably larger and amounts to 409 (Model V) to 573 (Model III) additional jobs in the average region. This means that the indirect employment effect of new business formation is between two and three times higher than the direct effect confirming our second hypothesis.

The results for the control variables are in line with our expectations. The negative sign for population density reflects the relatively unfavorable development of employment in the agglomerated areas during the period of analysis. Regional labor productivity has a positive impact on employment change in incumbent businesses. For employment change in new businesses we observe only a rather weak impact of labor productivity. This corresponds to the results of empirical analyses which find that most of the new businesses start with a below-average productivity level suggesting that the success of new businesses relies primarily on other factors than their productivity (Farinas and Ruano, 2005; Foster, Haltiwanger and Krizan, 2001; Wagner, 2007). The regions' share of employees with a tertiary degree is statistically significant with a positive sign for employment change in the incumbents but has a significantly negative effect on employment change in the new businesses. This may indicate that particularly the incumbents are able to draw benefits from the availability of highly qualified personnel while most of the newcomers are rather small and hardly employ personnel with a tertiary degree. If a positive impact of a high share of highly qualified employees should result from human capital spillovers (Blien, Suedekum and Wolf, 2006) our results suggest that the new businesses do not benefit from such an effect. The share

of employees in manufacturing impacts negatively on regional employment growth in incumbent businesses and in model III such an effect is also found for total employment change. This result probably reflects the downsizing of many old industries in the manufacturing sector (compare Bachman and Burda, 2007).

7. Conclusions

In this paper we developed and analyzed measures for employment change in new and in incumbent businesses. These measures allowed us to compare the employment change in new businesses with the indirect effects that start-ups have on incumbents. In particular, we have tested and confirmed two hypotheses that have been suggested by recent research on the employment effects of new businesses. First, the competitiveness-enhancing supply-side effects of new business formation outweigh their displacement effects. Second, the indirect effects stimulate more employment than is generated in the new businesses.

These findings have important implications for further analyses of the effects of new business formation as well as for public policy. A main conclusion for future research is that analyses of the post-entry performance, which were in the center of the empirical research on the effect of new business formation on economic development, are of rather limited relevance. Obviously, focusing solely on the evolution of the new businesses while neglecting the consequences for the incumbents is not an appropriate approach for investigating the issue. For a better understanding of the effects of start-ups on development, the new businesses should be regarded as in integral part of the market process. As markets can have rather different characteristics, the effects of entry may vary considerably according to these market specificities such as minimum efficient size, the stage of the product life cycle, the technological regime etc. Still, not much is known about the role of market characteristics for the impact of new businesses on the development of the market in terms of productivity, efficiency,

adjustment to environmental conditions, innovation and product variety. Moreover, there are strong indications that the indirect effects of new businesses differ between regions (Fritsch, 2008). Hence, further research should also try to get a deeper understanding of the role of region-specific factors for the employment effects of new businesses.

The analyses of effects of new business formation on regional development have an important policy implication regarding the market mechanism as a selection procedure. If the market does not work according to a survival of the fittest scenario, the competitiveness enhancing supply-side effects will not occur. If the market selection process does not function sufficiently well, entry will be more or less ineffective or even result in a decrease of welfare. Therefore, the highest priority of any policy towards entry is to secure a smooth and reliable selection of the fittest scenario. Particularly, policy should avoid anything that may distort this selection process. In this context, support of entries is a rather critical issue. Therefore, any policy that supports new firms after they have been set up may be considered as being questionable. Policy directed at stimulating entry may try to fuel the entrepreneurial spirit, provide advice for nascent entrepreneurs, lower administrative hurdles for start-ups etc. – however, it should abstain from any interference with fair competition.

The finding that the indirect effects of new business formation are quantitatively larger than the direct effects does *not* mean that the employment in the new businesses is unimportant. The indirect effects emerge through the interaction between the newcomers and the incumbents and would not occur without the start-ups challenging the incumbents. New businesses are the necessary but not the sufficient precondition for a positive effect on regional employment and development. Further research is needed to find out more about the factors that determine these employment effects.

Appendix

Table A1. Correlation matrix

		1	2	3	4	5	6	7	8
1	Total employment change *(∆EMPtotal)*	1							
2	Weighted employment change in incumbents *(∆EMPinc)*	0.9685	1						
3	Weighted employment change in new businesses *(∆EMPnew)*	0.6716	0.4659	1					
4	ln Start-up rate of previous ten years	0.1902	0.1621	0.1924	1				
5	ln Population density, t-1	-0.037	-0.0623	0.0543	-0.4199	1			
6	ln Labor productivity, t-1	0.3055	0.2394	0.3728	-0.0026	0.2724	1		
7	ln Share of highly qualified employees, t-1	0.1919	0.1908	0.1149	-0.4638	0.6628	0.5245	1	
8	Ln Share of manucaturing, t-1	-0.0119	0.0959	-0.3265	0.0003	-0.2155	-0.6324	-0.154	1

Note: Pooled data, 568 observations.

References

Acs, Zoltan J. and Pamela Mueller (2008): Employment Effects of Business Dynamics: Mice, Gazelles and Elephants, *Small Business Economics*, 30, 85-100.

Adolph, Christopher, Butler, Daniel M. and Sven E. Wilson (2005): Like shoes and shirt, one size does not fit all: Evidence on time series cross-section estimators and specifications from Monte Carlo experiments, mimeo

Aghion,Phillippe, Richard W. Blundell, Rachel Griffith, Peter Howitt, and Susanne Prantl (2008): The Effects of Entry on Incumbent Innovation and Productivity, Review of Economics and Statistics (forthcoming)

Aghion,Phillippe, Richard W. Blundell, Rachel Griffith, Peter Howitt, and Susanne Prantl (2004): Entry and Productivity Growth: Evidence from Micro-Level Panel Data, J*ournal of the European Economic Association*, 2, 265-276.

Arauzo-Carod, Josep-Maria, Daniel Liviano-Solis and Mònica Martin-Bofarull (2008): New business formation and employment growth: some evidence for the Spanish manufacturing industry, *Small Business Economics*, 30, 73-84.

Arellano, Manuel and Stephen Bond (1991): Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations, *Review of Economic Studies*, 58, 277-297.

Bachmann, Ronald and Michael Burda (2007): Sectoral Transformation, Turbulence, and Labour Market Dynamics in Germany, Ruhr Economic Papers #5

Baptista, Rui, Vitor Escária and Paulo Madruga (2008): Entrepreneurship, regional development and job creation: the case of Portugal, *Small Business Economics*, 30, 49-58.

Birch, David (1981): Who creates jobs? *The Public Interest*, 3-14.

Blien, Uwe, Suedekum, Jens and Katja Wolf (2006): Local employment growth in West Germany: A dynamic panel approach, *Labour Economics,* 13, 445-458.

Blundell, Richard W. and Stephen Bond (1998): Initial conditions and moment restrictions in dynamic panel data models, *Journal of Econometrics*, 8, 115-143.

Boeri, Tito and Ulrich Cramer (1992): Employment growth, incumbents and entrants – Evidence from Germany, *International Journal of Industrial Organization*, 10, 545-565.

Carree, Martin and Roy Thurik (2008): The Lag Structure of the Impact of Business Ownership on Economic Performance in OECD Countries, *Small Business Economics*, 30, 101-110.

Disney, Richard, Jonathan Haskell and Ylva Heden (2003): Restructuring and Productivity Growth in UK Manufacturing, *Economic Journal*, 113, 666-694.

Farinas, Jose C. and Sonia Ruano (2005): Firm productivity, heterogeneity, sunk costs and market selection, *International Journal of Industrial Organization*, 23, 505-534.

Foster, Lucia, John Haltiwanger and Cornell J. Krizan (2001): Aggregate productivity growth : lessons from microeconomic evidence' in: Charles R. Hulton, Edward R. Dean and Michael J. Harper (eds.), *New Developments in Productivity Analysis*, Chicago: University of Chicago Press: 303-363.

Fritsch, Michael (1996): Turbulence and Growth in West-Germany: A Comparison of Evidence by Regions and Industries, *Review of Industrial Organization*, 11, 231-251.

Fritsch, Michael (2004): Entrepreneurship, Entry and Performance of New Businesses Compared in two Growth Regimes: East and West Germany, *Journal of Evolutionary Economics,* 14, 525-542.

Fritsch, Michael and Udo Brixy (2004): The Establishment File of the German Social Insurance Statistics, *Schmollers Jahrbuch / Journal of Applied Social Science Studies,* 124, 183-190.

Fritsch, Michael and Antje Weyh (2006): How Large are the Direct Employment Effects of New Businesses? – An Empirical Investigation, *Small Business Economics,* 27, 245-260.

Fritsch, Michael (2008): How Does New Business Formation Affect Regional Development? *Small Business Economics*, 30, 1-14.

Fritsch, Michael and Pamela Mueller (2008): The Effect of New Business Formation in Regional Development over Time: The Case of Germany, *Small Business Economics*, 30, 15-29.

Fritsch, Michael and Florian Noseleit (2008): Investigating the Anatomy of the Employment Effects of New Business Formation, Paper prepared for presentation at the 48th Congress of the European Regional Science Association (ERSA), 27 – 31 August 2008 in Liverpool.

Fritsch, Michael and Alexandra Schroeter (2008): Why Does the Effect of New Business Formation Differ Across Regions ? Friedrich Schiller University Jena (mimeo).

Kitazawa, Yoshitsugu (2001): Exponential regression of dynamic panel data models, *Economics Letters*, 73/1, 7-13.

Klepper, Steven (1996): Entry, exit, growth, and innovation over the product life cycle, *American Economic Review*, 86, 562-583.

Kronthaler, Franz (2005): Economic capability of East German regions: results of a cluster analysis, *Regional Studies,* 39, 739-750.

Mueller, Pamela, André van Stel and David J. Storey (2008): The Effect of New Firm Formation on Regional Development over Time:

The Case of Great Britain, *Small Business Economics*, 30, 59-71.

Nickell, Stephen J. (1981): Biases in Dynamic Models with Fixed Effects, *Econometrica*, 49, 1417–1426.

Saviotti, Pier Paolo and Andreas Pyka (2004): Economic development, variety and employment, *Revue Économique*, 55, 1023-1049.

van Stel, André and Kashifa Suddle (2008): The Impact of New Firm Formation on Regional Development in the Netherlands, *Small Business Economics*, 30, 31-47.

Wagner, Joachim (1994): The Post-Entry Performance of New Small Firms in German Manufacturing Industries, *Journal of Industrial Economics*, 42, 141-154.

Wagner, Joachim (2007): Entry, Exit and Productivity – Empirical Results for German Manufacturing Industries, Jena Economic Research Papers 2007-064, Friedrich Schiller University and May Planck Institute of Economics, Jena, Germany.