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**Working Paper**

## Direct and indirect effects of new businesses on regional employment: an empirical analysis

Jena Economic Research Papers, No. 2008,074

**Provided in Cooperation with:**

Max Planck Institute of Economics

*Suggested Citation:* Fritsch, Michael; Noseleit, Florian; Schindele, Yvonne (2008) : Direct and indirect effects of new businesses on regional employment: an empirical analysis, Jena Economic Research Papers, No. 2008,074, Friedrich Schiller University Jena and Max Planck Institute of Economics, Jena

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# JENA ECONOMIC RESEARCH PAPERS



# 2008 – 074

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[www.jenecon.de](http://www.jenecon.de)

ISSN 1864-7057

The JENA ECONOMIC RESEARCH PAPERS is a joint publication of the Friedrich Schiller University and the Max Planck Institute of Economics, Jena, Germany. For editorial correspondence please contact [markus.pasche@uni-jena.de](mailto:markus.pasche@uni-jena.de).

Impressum:

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## Direct and indirect effects of new businesses on regional employment – An empirical analysis

Michael Fritsch  
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Yvonne Schindele

October 2008

### Abstract

We analyze different types of effects that new businesses may have on regional employment. We introduce different measures for employment change by separating employment change in incumbent businesses and employment change in new businesses. There are pronounced differences between regions with regard to the different employment effects. The average indirect employment effects of new business formation on incumbent employment are positive and are considerably larger than the employment that is directly generated in the new businesses.

JEL classification: L26, M13, O1, O18, R11

Keywords: Entrepreneurship, new business formation, regional development, direct and indirect effects

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## 1. Aims and scope

New businesses can contribute to regional employment in different ways. One of these ways is the employment that is generated in the new firms or establishments. The evolution of the newcomers, e.g. given by the number of their employees, their sales, or by their market share, may be labeled the direct effect of new business formation. This is, however, only a part of the contribution that the new businesses make to economic development. 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), and those that succeed 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 that are characterized by a relatively low productivity level have to reduce their output or exit.<sup>1</sup> At a constant output level, this market selection process should lead to a decline in employment, not to an increase, because fewer resources are needed for producing the given amount of goods and services at a higher productivity level. Hence, although starting a new business means creating additional capacities that require 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 (see Fritsch, 2008, for a review of the evidence).

As has been argued by Fritsch and Mueller (2004), new business formation in a region may also have several indirect effects on the incumbent businesses that evolve over a longer period of time. One type of such indirect effect is the crowding-out of incumbent businesses by the newcomers. A second type of indirect effect is an improvement on the supply-side due to the competition induced by entries that leads to higher competitiveness of the regional economy and, thereby, to

more employment. Analyses by Fritsch and Mueller (2004, 2008) suggest that the overall indirect effect of new business formation is positive in most regions. This implies that the supply-side effects are considerably larger than the crowding-out effects. Moreover, Fritsch and Mueller (2004, 2008) find indication that the indirect effects of new business formation are considerably larger than the direct effect, i.e. the employment in the newcomers.

In this paper, we want to assess and to compare the different effects of new business formation on regional employment. The following section (section 2) introduces the data and the spatial framework of the analysis. Section 3 investigates the employment share of new businesses measured as the share of employees in businesses younger than ten years over all private sector employees in the respective region (*total direct level effect*.) Other indicators focus on employment change rather than employment levels. We decompose regional employment growth into the development of incumbent businesses and employment growth of new businesses (section 4). Based on these measures, we then try to find out whether the indirect effects of new businesses on employment (i.e., employment change in incumbents) are more pronounced than the direct effects as measured by the employment change in the new businesses (section 5). The final section (section 6) concludes.

## **2. Data and spatial framework of the analysis**

Our data on start-ups and their employment are derived from the establishment file of the German Social Insurance Statistics. This database includes information on all establishments that have at least one employee subject to obligatory social insurance (Fritsch and Brix, 2004). This implies that pure self-employment businesses without any employee are excluded from the analysis. We exclude the public sector

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<sup>1</sup> Crowding-out effects may occur in the output market because the entrants gain market share as well as in the input market due to the additional demand of the new businesses for resources which can lead to scarcity of inputs and increasing factor prices.

because employment in the public sector is governed by other factors than private sector employment. The analysis includes the start-ups of the 1984-2002 period.

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 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 the planning regions of West Germany for two reasons. First, while data on start-ups for West Germany are currently available for the time period between 1983 and 2002, the time series for East Germany is much shorter – first 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., 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 historical 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.<sup>2</sup> Therefore, we have 71 regions in our sample.

### 3. The spatial and temporal dimension of total direct level effects

One part of the impact that start-ups have on employment are the jobs that are created by the new businesses. We measure this employment contribution of the new businesses as the sum of employees in all start-up cohorts of the previous ten years in  $t=0$  ( $t=0$  to  $t-9$ ) in relation to total employment in the current year ( $t=0$ ).<sup>3</sup> A period of ten years is taken because earlier studies have shown that the effect of new businesses on employment evolves over this time-span (Fritsch, 2008). This measure, the total direct level effect, describes the newness of regional employment and can be regarded as an indicator for restructuring or creative destruction in the regional economy during recent years.

Table 1: Descriptive statistics of the total direct level effects (all private industries)\*

	<i>Mean</i>	<i>Median</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Standard deviation</i>
Overall	16.8	16.5	11.2	27.1	2.8
Between			12.5	25.4	2.7
Within			14.2	23.1	0.8

\* Number of observations: 781.

In the 1992 to 2002 period, the mean share of employment in new businesses over all employees was 16.8 percent (table 1). There was considerable variation between a maximum value of 27.1 percent and a minimum of 11.2 percent. The variation of the direct level effect across regions (between) was much larger than the variation over time (within).

The regional distribution of the total direct level effect in all private industries for the years 1993 to 2002 shows a rather mixed picture (figure 1). Regions with relatively high direct level effects are

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<sup>2</sup> Hamburg has been merged with the region of Schleswig-Holstein South and Hamburg-Umland-Süd. Bremen was merged with Bremen-Umland.

<sup>3</sup> Example: The total direct level effect in the year 2002 is the sum of employees in the start-up cohorts of the years 1993 – 2002 in the year 2002 divided by total employment in private industries in the year 2002.

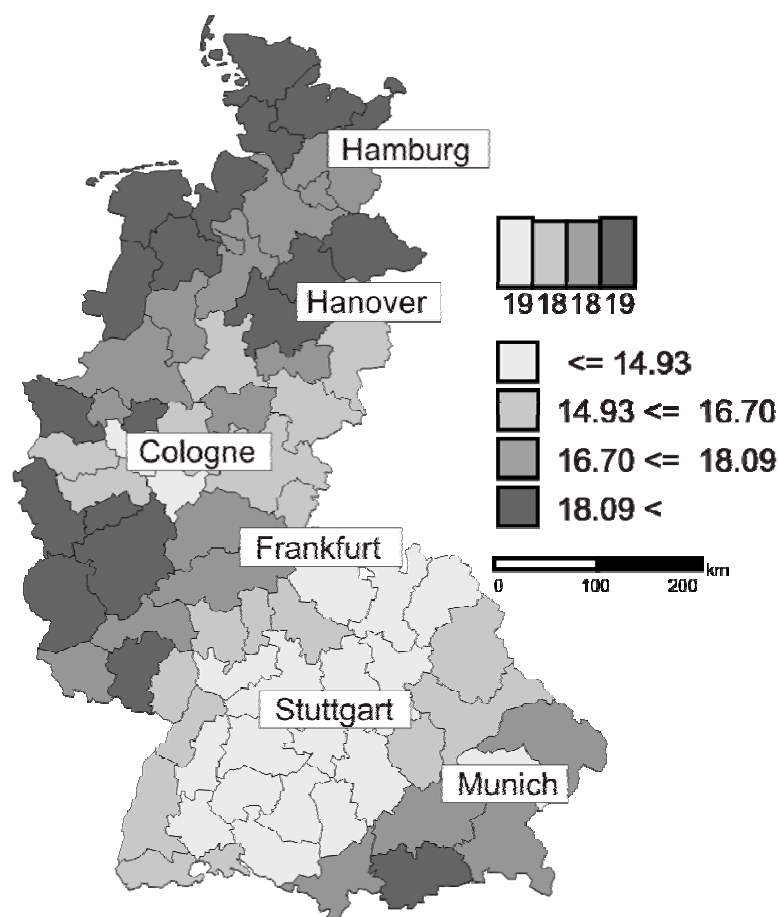


Figure 1: Total direct level effect in West German regions over the years 1993 to 2002 (all private industries)

concentrated in the northern part of West Germany while this contribution of new businesses to employment is relatively low in the regions around Stuttgart and in some of the regions north of Munich. These findings confirm the results of Audretsch and Fritsch (2002) and Fritsch and Mueller (2006) that regions of a certain type of growth regime tend to be clustered in space.

#### 4. The spatial and temporal dimension of employment growth

For each region, we are able to follow employment in yearly cohorts of newly founded businesses over time. The overall regional employment change ( $\Delta EMP_{total}$ ) results from the employment in the newly founded



businesses ( $\Delta EMP_{new}$ ) and from the employment change of the incumbents ( $\Delta EMP_{inc}$ ), i.e.

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

Using the information on total regional employment change ( $\Delta EMP_{total}$ ) and on employment in the new businesses ( $\Delta EMP_{new}$ ) we can calculate the employment change of the incumbents as

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

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.

Since the effect of new businesses on employment evolves over a period of about ten years (Fritsch, 2008), we determine the employment that the new businesses create 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. 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 that are at least ten years old. The annual 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  $t-2$ .<sup>4</sup> A two-year average is used in order to avoid disturbances by short-term fluctuations.

Table 2: Definition of variables for measuring employment change

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

The employment change in businesses younger than ten years and the employment change in incumbent businesses are weighted with its share of total employment. This is necessary in order to avoid that employment change of incumbents and employment change of new businesses do not add up to total employment change. Furthermore, this weighting procedure allows direct comparison with respect to descriptive as well as regression results. A simple example may illustrate the three employment change measures. If the total employment change is 5 percent, the share of employees in businesses younger than ten years is 20 percent, and the employment change in these young businesses is 9 percent, the respective employment change in businesses younger than ten years is weighted by 0.2 resulting in  $9 \times 0.2 = 1.8$  percent. In an analog manner, the employment change of incumbents – in our example 4 percent – is also weighted by

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<sup>4</sup> Employment in new businesses in t=0 and t-2 is based on the identical group of businesses. Thus, in t-2 the last ten cohorts are considered while in t=0, twelve cohorts are used including the two cohorts that entered the market between t-10 and t-12. This procedure assures that the indirect effects are not overestimated due to employees that have been considered as working in new businesses in t-2 and working in incumbent businesses in t=0.

its share in total employment: 80 percent in our example. The weighted employment change of businesses older than ten years is then  $4 \times 0.8 = 3.2$  percent. Summing up the weighted employment change of incumbents and new businesses leads to  $3.2 + 1.8 = 5$  percent, which is the total employment change. Table 2 displays the definitions of the different variables for the employment effects of new businesses.

It should be noted that the employment in the start-up cohorts of the previous ten years may also reflect indirect effects of new business formation over this period. The reason is that the development of new businesses that have been set-up during the previous decade may well be affected by competitors that have entered the market during this time-span. Table 3 displays descriptive statistics of the different employment change measures.

Table 3: Descriptive statistics for employment change\*

<i>Variable</i>	<i>Mean</i>	<i>Median</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Standard deviation<sup>a</sup></i>
Total employment change ( $\Delta EMP_{total}$ )	.117	-0.004	-7.632	8.872	2.918 (1.389 / 2.571)
Weighted employment change in new businesses ( $\Delta EMP_{new}$ )	2.963	2.842	0.723	5.935	0.826 (0.433 / 0.706)
Weighted employment change in incumbents ( $\Delta EMP_{inc}$ )	-2.839	-2.871	-9.456	6.003	2.445 (1.246 / 2.109)

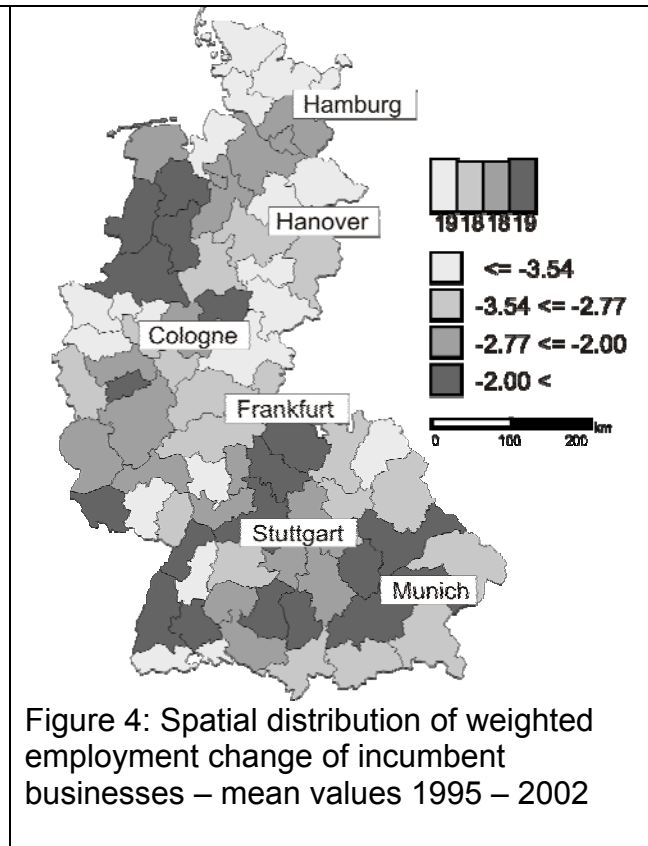
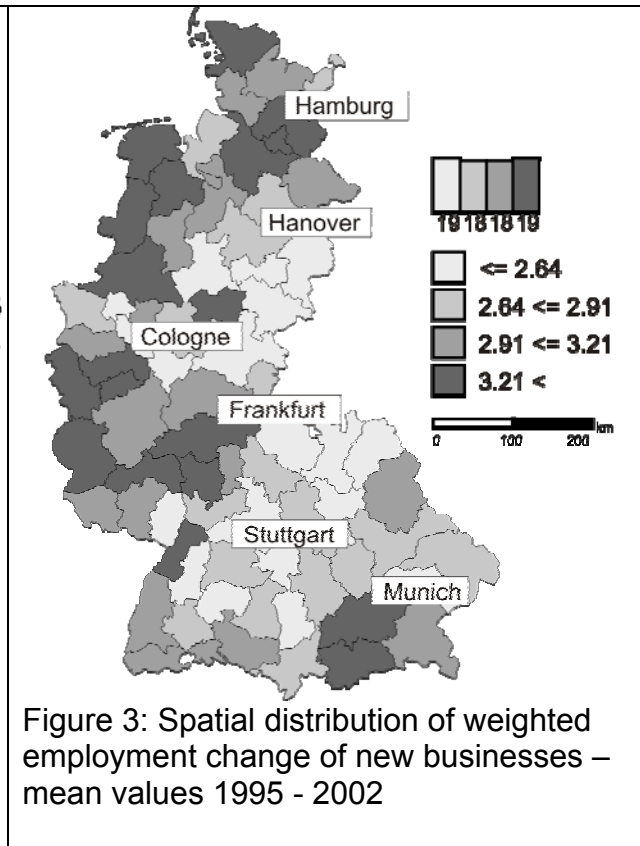
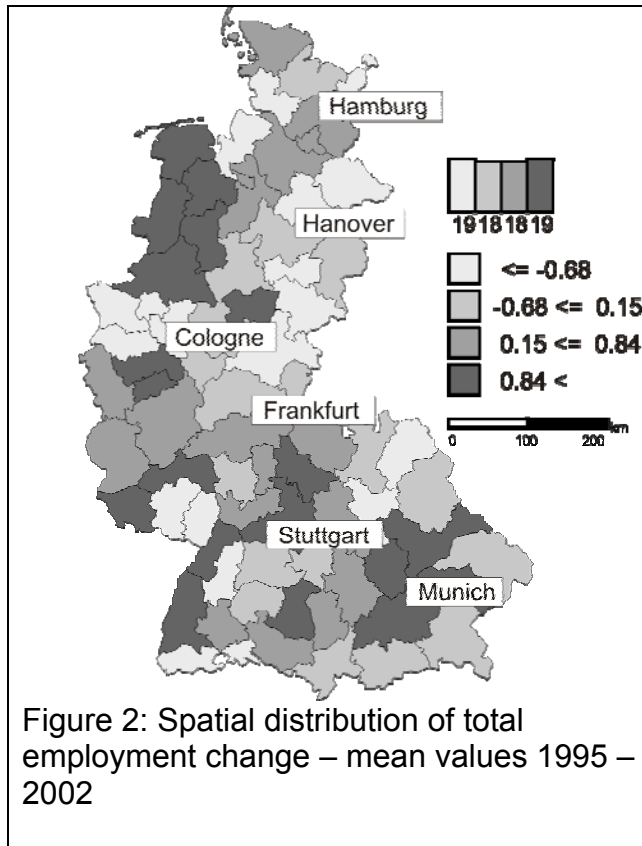
\* The number of observations is 568 for each of the variables. Figures in parentheses display the between (71 regions) and within (8 time periods) standard deviation.

The mean value of average total employment change over all regions is slightly positive (0.117 percent). Despite the positive average development, there are several regions that suffered a decline of overall employment in the period of analysis. The weighted average two-year employment change in the incumbent businesses is strongly negative. The weighted changes of employment that can be directly attributed to

new businesses are positive over all years and for all regions, resulting in a mean value of 2.963 percent.

The regional distribution of weighted employment change in incumbent businesses (figure 4) is quite similar to the regional pattern of total employment change (figure 2). This is also expressed by the high correlation coefficient of 0.97 between the two measures (see table A1 in the Appendix). More pronounced differences of the regional patterns can be found when comparing total employment change to weighted employment change in new businesses (correlation coefficient: 0.67). The correlation coefficient for the relationship between weighted regional employment change in incumbents and in new businesses is 0.47. Spatial concentration of highly positive employment change in new businesses can be observed in the regions around Hamburg, Cologne, Frankfurt, and Munich. The northern border area to the Netherlands and Denmark also shows highly positive employment change in new businesses.

Comparing the spatial dimension of the total direct level effect (figure 1) with the total employment change (figure 2) shows no obvious coherence. The correlation coefficient for the relationship between these two measures is 0.05 (table A1 in the Appendix). The correlation between the direct level effect and the weighted employment change in incumbent businesses is also rather low (-0.08). The statistical relationship between the direct level effect and weighted employment change in new businesses is somewhat stronger (0.40), thus indicating that relatively high employment growth in the new businesses leads to a larger direct level effect.



## **5. Employment in start-ups and the effect of start-ups on the incumbents**

In this section, we apply the different measures of regional employment growth presented in section 3 to an analysis of regional employment growth. In particular, we want to find out whether the direct or the indirect effects of new businesses have a larger impact on regional employment growth. We also investigate the impact of the direct level effect and the impact of a number of control variables.

### **5.1 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 important 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. For example, start-up rates are higher in the service sector than in manufacturing 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 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. 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.

We use the average start-up rate over a ten-year period in order to account for the relevant time lag that has been identified in previous analyses. In addition, we also include the direct level effect (share of employees in new businesses younger than ten years over all employees). The direct level effect of start-ups, i.e. their employment share, indicates the success of new businesses. Including this variable into the model gives us the opportunity to compare the effect of the level of start-up activity and of the success of the start-ups on the different measures of employment growth. This variable may represent several effects. First, it controls for the relative size of the new business sector. The larger the share of employees in new businesses the larger their contribution to total employment change can be. Second, the employment share of new businesses may indicate the 'strength' of new businesses in a region in competing with the incumbents.<sup>5</sup>

In the models for explaining total employment change and employment change in newly founded businesses, we expect a positive coefficient for the start-up rate. In models with employment change in the incumbent businesses, the coefficient of the start-up rate indicates the direction and the magnitude of the indirect employment effects. If the indirect effects of new business formation is mainly a displacement of incumbents, the respective coefficient of the start-up rate should be negative (table 4, hypothesis 1a). A positive coefficient for the start-up rate indicates that the supply-side effects are considerably larger than the displacement of incumbents (table 4, hypothesis 1b). If the jobs in

the newly founded businesses are the only contribution of start-ups to regional employment or if positive and negative indirect effects are of

Table 4: Competing hypotheses of the indirect effects of new business formation on regional employment change

Variable	Assumed impact on regional employment change in incumbent businesses	Expected sign
Start-up rate	<p><i>Entries have positive and negative indirect effects on employment change of incumbents:</i></p> <p><i>Hypothesis 1a:</i> Negative impact of entries on employment change in incumbents if positive supply side effects are smaller than displacement effects.</p> <p><i>Hypothesis 1b:</i> Positive impact of entries on employment change in incumbents if positive supply side effects are larger than displacement effects.</p>	<p>Coefficient for employment change of incumbents</p> <p>–</p> <p>+</p>
Start-up rate	<p><i>Hypothesis 2a:</i> The direct effects of new business formation on regional employment change are larger than the indirect effects.</p> <p><i>Hypothesis 2b:</i> The indirect effects of new business formation on regional employment change are larger than the direct effect.</p>	<p>Coefficient larger for new businesses</p> <p>Coefficient larger for incumbent businesses</p>
Share of employees in new businesses	<p><i>A high share of employees in new businesses indicates high quality of newcomers in terms of competitiveness. High quality entries lead to more pronounced supply side effects but also to larger displacement effects:</i></p> <p><i>Hypothesis 3a:</i> Competitive entry induces supply side effects that are larger than the displacement effects.</p> <p><i>Hypothesis 3b:</i> Competitive entry induces supply side effects that are smaller than the displacement effects.</p>	<p>Coefficient for employment change of incumbents</p> <p>+</p> <p>–</p>

<sup>5</sup> The correlation coefficient between the regional start-up rate and the direct level effect is only about 0.41 (table A1 in the Appendix) indicating that a relatively high level of start-ups does not automatically lead to a correspondingly high direct level effect?



about the same magnitude, the coefficient for the start-up rate should be not significantly different from zero. By comparing the coefficients for the start-up rate in the different models, we can assess the relative magnitude of the direct and the indirect effects of new business formation on employment (hypotheses 2a and 2b in table 4). For the direct level effect of new businesses, i.e. their employment share after ten years, we expect a positive impact on total employment change and on employment change in the new businesses. The effect on employment change in the incumbents is, however, unclear. On the one hand, successful new businesses may stimulate the development of the incumbent firms (hypothesis 3a in table 4). On the other hand, this success of newcomers can also lead to larger displacement effects in the incumbents, thereby constraining their employment growth (hypothesis 3b in table 4).

We tested a number of additional variables that may have an impact on regional employment in order to control for these influences. These variables are population density, the qualification of the regional workforce, regional labor productivity, and the share of employment in the manufacturing sector. Because many regional characteristics (e.g., land prices, availability of qualified labor, and other inputs) tend to be correlated with population density, this variable can be considered a catch-all indicator for various aspects of the local conditions. Since the development of employment in West German agglomerations has been below average in the period under analysis, we expect a negative sign for population density. The qualification of the regional workforce is measured as the share of employees with a tertiary degree over all employees in private industries. We expect a positive influence of this variable on all three types of employment growth measures.

The regional labor productivity indicates competitiveness of the regional economy and should have a positive impact on overall employment change as well as on employment change in incumbents. Since diverse previous studies have found that new businesses start with a productivity level that is below average (Bartelsman and Doms,

2000; Farinas and Ruano, 2005), a successful entry in a high productivity region may be relatively difficult resulting in a correspondingly high danger of failure for the entrants. We, therefore, expect that the effect of the level of regional labor productivity on employment change in new businesses is weaker for newcomers than for the incumbents.

Table 5: Descriptive statistics for dependent and independent variables\*

<i>Variable</i>	<i>Mean</i>	<i>Median</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Standard deviation</i>
Total employment change ( $\Delta EMP_{total}$ ) (in %)	0.117	-0.004	-7.633	8.872	2.918
Weighted employment change in new businesses ( $\Delta EMP_{new}$ ) (in %)	2.963	2.842	0.723	5.935	0.826
Weighted employment change in incumbents ( $\Delta EMP_{inc}$ ) (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
Direct level effect (share of employees in new businesses younger than ten years over all employees) (ln)	-1.815	-1.181	-2.152	-1.390	0.154
Population density, t-1 (ln)	5.440	5.316	4.318	7.126	0.657
Regional 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

\* The number of observations is 568 for each of the variables. In the regression, the employment change is expressed in values between 0 and 1.

The regional share of employees in manufacturing may indicate the regional position with regard to the secular shift from the manufacturing

sector towards services. Regions with a high share of manufacturing employment may have less growth in incumbent businesses but more growth in new businesses because the majority (about 80 percent) of start-ups in Germany is set-up in the service sector. Therefore, a positive impact of the share of employees in manufacturing on employment change in new businesses could indicate a contribution of new businesses to structural change. Table 5 provides descriptive statistics for the variables used in the models.

## 5.2 Estimation approach

The basic approach of our analysis is to regress the cumulative start-up rate of the previous ten years on the different measures of employment change – thereby evaluating the size of the different effects. Since the logarithms of the independent level variables are regressed on the log employment change, the coefficients can be interpreted as quasi elasticities, i.e. the average percentage change of employment due to a one percentage change of value of an independent variable. The model is specified as

$$\Delta \ln \text{Empl}_{i,t} = \beta_0 + \beta_2 \ln \Sigma \text{Start up rate}_{i,t} + \beta_3 Z_{i,t} + \nu_i + \varepsilon_{i,t}$$

with  $\Delta \ln \text{Empl}_{i,t}$  as the respective employment change (total / incumbents / new businesses).

Although the regions can be regarded as functional units, we correct for possible spatial interactions by applying a spatial lag maximum likelihood approach (see Anselin, 1988, for details). The respective 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.

### 5.3 Results

We find that the start-up rate has a significantly positive effect on overall employment change as well as on employment change in the new and in the incumbent businesses (table 6). A comparison of the coefficient for the start-up rate between models clearly shows that the (indirect) effects of new businesses on employment in the incumbents are always considerably larger than the (direct) effect of employment change in new businesses. This result is very robust for different versions of the model and strongly confirms the supposition of Fritsch and Mueller (2004, 2008). The direct level effect of new business formation has a positive impact on total employment change as well as on employment change in new and in incumbent businesses (models II and III). The relatively strong impact on employment change in the incumbents is quite remarkable given the low direct correlation between the two variables of only -0.08 (table A1 in the Appendix). It may be regarded as an indication that the newcomers induce higher supply side effects in the incumbents if they prove to be competitive and economically successful.

The effect of population density on employment change tends to be negative, obviously reflecting the below average employment growth in agglomerations in the period under inspection. Regional labor productivity has a positive impact on total employment change and on employment change in the incumbents. According to our expectations, the effect is considerably weaker for the employment change in the new businesses. The regional share of highly qualified employees also has a positive effect on total employment change and employment change in the incumbents but not on employment in new businesses. The share of employees in manufacturing has the expected positive effect on employment change of new businesses in all types of models with the exception of model I. While model I and II identify the expected negative effect of the share of employees in manufacturing on employment change in the incumbents, the respective coefficient shows no clear effect in model III. The coefficient for the employment share in

Table 6: Regression results

	Model I			Model II			Model III		
	Overall	In incumbents	In new businesses	Overall	In incumbents	In new businesses	Overall	In incumbents	In new businesses
Average start-up rate of previous ten years	0.237** (0.023)	0.167** (0.018)	0.0750** (0.009)	–	–	–	0.219** (0.024)	0.157** (0.019)	0.067** (0.009)
Direct level effect, t-1	–	–	–	0.173** (0.034)	0.105** (0.027)	0.068** (0.011)	0.124** (0.034)	0.070** (0.027)	0.053** (0.011)
Population density, t-1	-0.323** (0.12)	-0.231* (0.094)	-0.091* (0.038)	-0.332** (0.11)	-0.247** (0.090)	-0.089* (0.037)	-0.275* (0.12)	-0.204* (0.093)	-0.071 (0.037)
Regional labor productivity, t-1	0.107* (0.046)	0.082* (0.035)	0.029* (0.014)	0.167** (0.046)	0.125** (0.036)	0.046** (0.014)	0.104* (0.044)	0.080* (0.034)	0.027* (0.013)
Share of highly qualified employees, t-1	0.060* (0.024)	0.064** (0.019)	-0.005 (0.007)	0.091** (0.025)	0.087** (0.020)	0.004 (0.007)	0.059* (0.024)	0.063** (0.019)	-0.006 (0.007)
Share of manufacturing employment, t-1	-0.047 (0.037)	-0.066* (0.028)	0.019 (0.012)	-0.025 (0.041)	-0.057* (0.032)	0.032* (0.013)	0.001 (0.040)	-0.039 (0.031)	0.039** (0.012)
Constant	-0.670 (0.90)	-0.537 (0.71)	-0.201 (0.26)	0.209 (0.93)	0.084 (0.73)	0.094 (0.26)	-0.523 (0.90)	-0.452 (0.71)	-0.138 (0.24)
rho (spatial lag)	0.038* (0.015)	0.037** (0.011)	-0.005 (0.006)	0.041** (0.015)	0.034** (0.011)	-0.001 (0.006)	0.037* (0.015)	0.036** (0.011)	-0.004 (0.006)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	568	568	568	568	568	568	568	568	568
Variance ratio	0.57	0.63	0.40	0.53	0.60	0.36	0.58	0.64	0.42
Wald-test	6.15*	10.90**	0.72	7.26**	9.1**	0.05	6.18*	10.57**	0.56
LM-test	3.96*	9.06**	0.68	4.09*	6.97**	0.03	3.90*	8.72**	0.51
Log-likelihood	1443.31	1586.59	2063.16	1418.47	1563.24	2047.22	1450.34	1590.26	2074.36

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.

manufacturing in the model for total employment change is not statistically significant probably because the positive effects on new businesses are compensated by the negative effect on incumbents.

## **6. Conclusions**

In this paper, we have analyzed the importance of the direct and indirect contributions of new businesses to employment change. Particularly, we decomposed total employment change into employment change in the incumbent businesses and employment change that can be attributed to new businesses entering the market. We find that employment in the new businesses contributes an important share to total employment change.

Separating employment change of incumbent businesses (older than ten years) from employment change of new businesses (younger than ten years) allowed us to identify direct and indirect effects of new business formation. We found that the effect of start-ups on incumbent employment is always positive and considerably more pronounced than the employment contribution that can be directly attributed of the new businesses. This clearly indicates that the indirect effects of new business formation are quantitatively more important than the direct effects. An important implication of this finding is that a focus on the development of new businesses, which has been characteristic for nearly the entire research on their employment effects, is largely misleading. It would be much more important to know more about the indirect effects of new business formation and the factors that influence their magnitude.

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## Appendix

Table A1. Correlation matrix

		1	2	3	4	5	6	7	8	9
1	Total employment change ( $\Delta EMP_{total}$ )	1								
2	Weighted employment change in incumbents ( $\Delta EMP_{inc}$ )	0.97	1							
3	Weighted employment change in new businesses ( $\Delta EMP_{new}$ )	0.67	0.47	1						
4	In Start-up rate of previous ten years	0.19	0.16	0.19	1					
5	In Direct level effect, t-1	0.05	-0.08	0.40	0.41	1				
6	In Population density, t-1	-0.04	-0.06	0.05	-0.42	-0.06	1			
7	In Labor productivity, t-1	0.31	0.24	0.37	0.00	0.43	0.27	1		
8	In Share of highly qualified employees, t-1	0.19	0.19	0.11	-0.46	-0.15	0.66	0.52	1	
9	In Share of manufacturing, t-1	-0.01	0.10	-0.33	0.00	-0.75	-0.22	-0.63	-0.15	1

Note: Pooled data, 568 observations