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**Working Paper**

## The effect of new business formation on regional development over time: the case of Germany

Freiberger Arbeitspapiere, No. 2006/13

**Provided in Cooperation with:**

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*Suggested Citation:* Fritsch, Michael; Mueller, Pamela (2006) : The effect of new business formation on regional development over time: the case of Germany, Freiberger Arbeitspapiere, No. 2006/13, Technische Universität Bergakademie Freiberg, Fakultät für Wirtschaftswissenschaften, Freiberg

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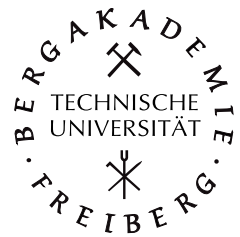
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The Effect of New Business Formation  
on Regional Development over Time:  
The Case of Germany

**FREIBERG WORKING PAPERS**  
**FREIBERGER ARBEITSPAPIERE**

**# 13**  
**2006**

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**ISSN 0949-9970**

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**Abstract**

We investigate the effects of new business formation on employment change in German regions. A special focus is on the lag-structure of this effect and on differences between regions. The different phases of the effects of new business formation on regional development are relatively pronounced in agglomerations as well as in regions with a high-level of labor productivity. In low-productivity regions, the overall employment effect of new business formation activity might be negative. The interregional differences indicate that regional factors play an important role.

JEL-classification: M13, O1, O18, R11

Keywords: Entrepreneurship, new business formation, regional development.

**Zusammenfassung**

*“Die Wirkungen von Gründungsaktivitäten auf die Regionalentwicklung über die Zeit: Der Fall Deutschland”*

Wir untersuchen die Wirkungen von Gründungen auf die Beschäftigungsentwicklung in deutschen Regionen. Ein besonderes Augenmerk liegt dabei auf der Lag-Struktur dieser Effekte und auf regionalen Unterschieden. Die verschiedenen Effekte sind in den Verdichtungsgebieten sowie in Regionen mit hoher Arbeitsproduktivität besonders stark ausgeprägt. In Regionen mit niedriger Arbeitsproduktivität können die Arbeitsplatzwirkungen der Gründungen sogar negative sein. Die Unterschiede zwischen den Regionen weisen auf eine große Bedeutung regionaler Gegebenheiten hin.

JEL-Klassifikation: M13, O1, O18, R11

Schlagworte: Entrepreneurship, Gründungen, Regionalentwicklung.

## 1. Aims and scope

Recent studies have shown very clearly that the impact of new business formation on regional development is distributed over a longer period of time (Audretsch and Fritsch, 2002; Fritsch and Mueller, 2004, 2006; van Stel and Storey, 2004). Moreover, these studies revealed pronounced differences in the magnitude of the effect across regions. This paper extends our earlier work on the impact of new business formation on regional development in Germany (Fritsch and Mueller, 2004, 2006) in analyzing regional differences in much more detail. In contrast to our earlier study, we perform the analysis on the level of planning regions instead of districts as spatial units. Planning regions may be better suited as units of analysis because they account for economic interaction between districts. For this reason, the analysis is less likely to be subject to spatial autocorrelation.

The following section addresses data and measurement issues. Section 3 reports the analysis of the short-, medium-, and long-term impact of new business formation on regional employment. Differences in the effects across regions are investigated in section 4. The final section draws conclusions for policy as well as for further research.

## 2. Data and measurement approach

Our analysis of the effect of new business formation on regional economic development over time is at the spatial level of planning regions (*Raumordnungsregionen*). Planning regions consist of at least one core city and the surrounding area. Therefore, the advantage of planning regions in comparison to districts (*Kreise*) is that they can be regarded as functional units in the sense of traveling to work areas and that they account 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 74 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., 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.

The establishment file of the German Social Insurance Statistics provided the number of new businesses and employees (for a description, see Fritsch and Brixy, 2004). This database comprises information about all establishments that have at least one employee subject to obligatory social insurance. Due to the fact that the database records only businesses with at least one employee, start-ups consisting of only owners are not included. Unfortunately, the German Social Insurance Statistics is completely on the level of establishments and does not allow us to separate new firms from new plants and new branches which are created by existing firms. In order to avoid distortions caused by new large subsidiary plants of incumbent firms, new establishments with more than 20 employees in the first year of their existence are not counted as start-ups.<sup>1</sup> Data on regional gross value added and population density (population per square km) are from various publications of the German Federal Statistical Office.

New business formation activity is measured by the yearly start-up rates 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 (see also Audretsch and Fritsch, 1994). An important adjustment was made to control for the fact that not only does the composition of industries differ 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

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<sup>1</sup> The share of new establishments in the data with more than 20 employees in the first year is rather small (about 2.5 percent).

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 the estimates using the non-adjusted start-up rate do. However, the basic relationships are left unchanged.

Our indicator for regional development is the average yearly employment change over a two-year period (percentage), 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. Due to the fact that start-up rates in subsequent years are highly correlated (Fritsch and Mueller, 2005), we apply Almon polynomial lags for estimating the time lag-structure of the effect of new business formation on regional development (for details, see Greene, 2003 as well as van Stel and Storey, 2004; Fritsch and Mueller, 2004). This method reduces the effects of multicollinearity in distributed lag settings by imposing a particular structure on the lag coefficients. A critical issue in applying the Almon lag procedure is determining which type of polynomial to assume. As in our earlier study (Fritsch and Mueller, 2004), the third-order appears to be the best fit. Therefore, we conclude that a third-order polynomial is the best approximation of the lag-structure. The lag-structure related to the short-, medium- and long-term effects of new businesses is similar if a higher polynomial is applied; thus, the results are not presented here<sup>2</sup>. We always report the results from the Almon procedure as well as the unrestricted coefficients. Due to some slight heteroscedasticity in the data, we apply robust estimation techniques. Although the analysis is on the level

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<sup>2</sup> The results are available from the authors upon request.



of planning regions, spatial autocorrelation might still exist. In order to account for such effects we cluster the standard errors by the Federal States (*Länder*), which are an important level of policy making, in order to capture spillovers between planning regions. Models are conducted with fixed-effects in order to account for unobserved region-specific influences.

### **3. The effect of new business formation on regional employment over time**

The model for the analysis of the effect of new business formation on regional employment over time relates the start-up rate of the current period ( $t_0$ ) as well as the start-up rate of the ten preceding periods ( $t_{-1}$  to  $t_{-10}$ ) to the average rate of employment change between  $t_0$  and  $t_{+2}$  (table 1). Start-up rates dating back more than ten years were not included into the model because they did not prove to have any significant effect. In order to control for all kinds of regional characteristics which might affect the relationships between new firm formation and employment change, we incorporated population density (number of inhabitants per square km) as an independent variable in our models. Population density in a region is highly correlated with a number of factors such as the wage level, real estate prices, quality of communication infrastructure, qualification of the workforce and diversity of the labor market, presence of small businesses as well as industry structure (e.g., share of employees in services) in the respective region. Therefore, population density can be regarded as a catch-all variable for these regional characteristics. Region-specific characteristics that are not related to population density are accounted for by the fixed-effects of the panel estimation technique applied.

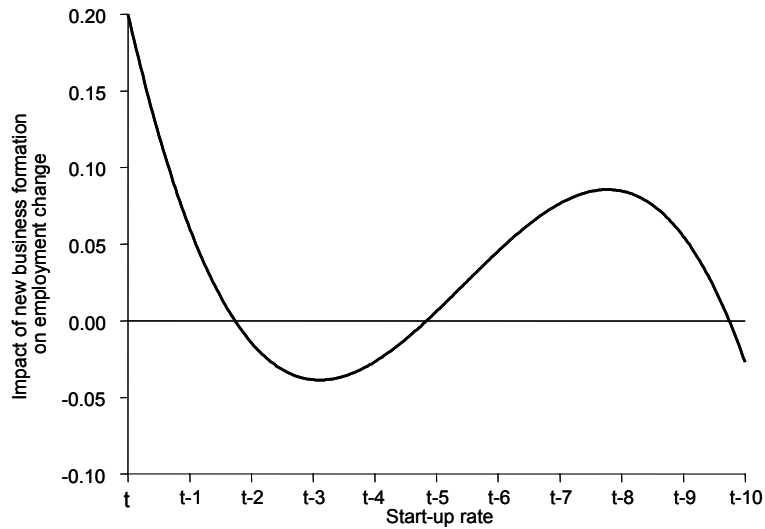


Figure 1: The lag-structure of the impact of new business formation on regional employment change – robust regression with fixed-effects

Table 1: The effect of new business formation on regional employment change – robust regression with fixed-effects

	Fixed-effects			
	Un-restricted	Almon method (3 <sup>rd</sup> order polynomial)		
Start-up rate t-0	0.282** (5.47)	$\alpha_0$	0.208** (2.61)	0.208
Start-up rate t-1	-0.056 (1.01)	$\alpha_1$	-0.182** (4.18)	0.064
Start-up rate t-2	0.083 (2.08)	$\alpha_2$	0.041** (4.20)	-0.012
Start-up rate t-3	0.032 (0.50)	$\alpha_3$	-0.003** (3.66)	-0.037
Start-up rate t-4	-0.024 (0.40)			-0.025
Start-up rate t-5	-0.044 (0.76)			0.009
Start-up rate t-6	0.104* (2.97)			0.049
Start-up rate t-7	0.152* (0.30)			0.081
Start-up rate t-8	0.035 (0.95)			0.089
Start-up rate t-9	0.019 (0.31)			0.059
Start-up rate t-10	0.014 (0.20)			-0.025
$\Sigma$ coefficients start-up rate t-0 to t-10	0.597			0.460
Population density	0.041 (0.79)			0.037 (0.73)
Constant	-19.081 (1.03)			-16.703 (0.93)
R <sup>2</sup> -adjusted	0.1412			0.1186
Log-likelihood	-932.41			-943.61
No. of observations	592			592

Estimations at the level of planning regions (figure 1 and table 1) lead to about the same shape of the lag-structure as our earlier analyses (Fritsch and Mueller, 2004). There is a positive short-term effect at the time where the new businesses are set up and create new employment, a negative medium-term effect which is characterized by the displacement of competitors as well as the exit of newly founded businesses, and finally a positive long-term effect that is probably due to improvements on the supply-side of the regional economy. The long-term effect reaches a maximum after approximately seven years and fades away after about nine years. Remarkably, the coefficients are considerably smaller than what was found in our analysis on the level of districts (Fritsch and Mueller, 2004). The reason for these differences is that extreme values for single districts are evened out in data at the level of planning regions, which are much larger than districts. The size of the coefficients that we find on the level of planning regions is comparable to the coefficients of the analysis for the Netherlands (van Stel and Suddle, 2007) and for Great Britain (Mueller, van Stel and Storey, 2007). Population density that was included as a control variable did not prove to be significant in any of the models.<sup>3</sup>

The sum of the coefficients for the start-up rates in the different years gives the overall effect of new business formation on employment change. The value of 0.597 for the unrestricted model and 0.460 for the model applying the Almon lag procedure (table 1) indicates that each additional new business per 1,000 workforce leads to an average increase of employment growth by about a 0.5 percentage point.

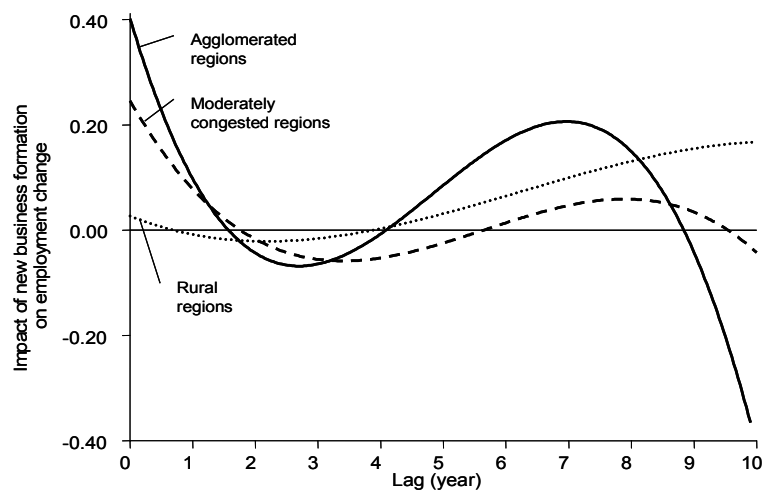
#### **4. Differences across regions**

Regions may differ considerably with regard to the characteristics of the new and incumbent businesses as well as with regard to their ability to absorb the positive effects of new business formation. In order to analyze such differences, we distinguish regions according to the degree of agglomeration or population density and by the average level of labor productivity.

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<sup>3</sup> A main reason for insignificance of population density in the fixed-effect regression is probably that the value of this variable does not change much over time. The coefficients for the fixed-effects range between -2.9 and 3.3 with a median of -0.18 and a mean value of about zero.

With regard to population density, we follow the common classification of German planning regions in highly agglomerated areas, moderately congested regions, and rural areas. This classification is based on population density and the settlement structure in a region (Federal Office for Building and Regional Planning, 2003). An analysis for agglomerations, moderately congested regions, and rural areas shows that new business formation in agglomerations does not only create relatively pronounced positive short-term (direct) effects but also leads to comparatively high, positive long-term (supply-side) effects. Also the negative medium-term (displacement) effects are slightly stronger for the agglomerations. As can be clearly seen from figure 2, the effects of new business formation on employment change are much more pronounced in the agglomerations than in the other spatial categories. This holds particularly for the short-term employment effects. While the overall effect on employment change over a period of ten years is highest in the agglomerations, the difference between the moderately congested areas and the rural regions is not that clear (table 2). This is obviously due to the strong, positive long-term effect that we find for the rural regions. The results for the rural regions, however, should be regarded with caution because only two of the eleven coefficients for start-up rates in the unrestricted model prove to be statistically significant and the coefficients for the Almon lags remain insignificant.

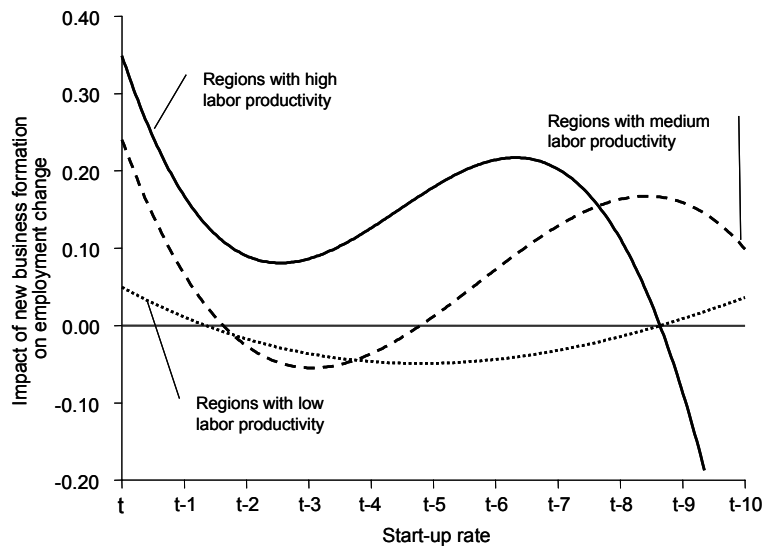


*Figure 2: The structure of the impact of new business formation on regional employment change in agglomerations, moderately congested regions and rural regions*

The relatively strong positive long-term employment effect of start-ups in agglomerations may be explained by a correspondingly high degree of competition in these areas facilitating the selection process and stimulating the performance of surviving firms. A higher level of competition in agglomerations directly results from the high density of businesses in an area, i.e., more firms demanding similar inputs or supplying goods and services on the same market. The conjecture of a relatively high-level of competition in agglomerations is supported by empirical analyses that find higher start-up rates (Fritsch and Falck, 2006) but a lower probability of survival (Fritsch, Brixy, and Falck, 2006; Engel and Metzger, 2006; Weyh, 2006) in these areas. Another explanation for a stronger effect of new business formation on developments in the agglomerations could be based on the observation that the share of start-ups in knowledge-intensive industries and in high-tech industries tends to be relatively high in the agglomerations and relatively low in rural areas (Audretsch, Keilbach, and Lehmann, 2006, 87-90; Bade and Nerlinger, 2000).<sup>4</sup> Assuming that knowledge-intensive or innovative start-ups impose a greater challenge on incumbent firms than non-innovative start-ups (Fritsch, 2006), the higher share of such new businesses in agglomerations may be responsible for the more pronounced effects of new business formation in these regions (see also Mueller, 2006). This can, however, not explain the pronounced long-term supply-side effects that we find for the rural areas.

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<sup>4</sup> According to our data, the share of start-ups in knowledge intensive industries in the agglomerations in the years 1998-2002 is 33.6 percent as compared to 28.4 percent in rural regions and 30.0 percent in the intermediate category, the moderately congested regions. The share of startup in high-tech industries on all manufacturing start-ups is 11.9 percent in agglomerations, 9.7 in moderately congested regions and 10.0 in the rural regions. For the classification of German industries see Grupp and Legler (2000) and BMBF (2005).



*Figure 3: The structure of the impact of new business formation on regional employment change in low-productivity regions versus other regions*

Drawing a distinction between regions according to their economic performance, namely, labor productivity, the differences of the effects of new business formation on employment are much more pronounced. We classify regions with labor productivity levels in the lower quartile of the distribution (i.e.,  $\leq 25$  percent) as low-productivity regions.<sup>5</sup> Regions with a value of labor productivity in the upper quartile ( $\geq 75$  percent) are classified as high-productivity regions. Regions with a labor productivity value in the second and the third quartiles are categorized as medium-productivity regions.<sup>6</sup> The results indicate that low-productivity regions experience a relatively small short-term employment effect of new firm formation, which is clearly offset by a negative displacement effect. Furthermore, the positive supply-side effect appears to be rather poor in these regions (figure 3). Remarkably, the overall employment effect of new businesses in low-productivity regions is negative. According to the estimates with the Almon polynomial, the overall employment effect is not statistically significant.

<sup>5</sup> Labor productivity is measured by real GDP per working population.

<sup>6</sup> Regions are classified according to the average labor productivity in the period of analysis. See table A1 in the Appendix for this classification. We do not classify regions according to labor productivity in the year of start-up because this would, for some regions, lead to changes over time that would not allow the application of fixed-effects regression techniques.

In contrast to low-productivity regions, the effects in high-productivity regions are rather positive in all three phases so that new business formation results in a relatively strong employment increase. However, after nine years the effect is fading away. In regions with a medium-productivity level, the positive effect on employment change in the first phase is lower than that in high-productivity regions but stronger than in regions with a low level of productivity. While we find a slightly negative impact for the second phase (displacement effects) in the medium-productivity regions, the third phase (supply side effects) is long lasting with a pronounced increase of employment.

*Table 2: Overall effect of new business formation on regional employment change*

	Overall effect of new business formation on employment change (sum of coefficients)	
	Unrestricted	Almon method (3 <sup>rd</sup> order polynomial)
Agglomerations	0.661	0.541
Moderately congested regions	0.416	0.184
Rural regions	0.582	0.158
High-labor productivity regions ( $\geq 75\%$ )	1.452	1.016
Regions with medium- labor productivity ( $> 25\%$ and $< 75\%$ )	0.969	0.824
Low-labor productivity regions ( $\leq 25\%$ )	-0.012	-0.133

The overall effect of new business formation on employment change appears to be related to the regional level of labor productivity (table 2). Over a period of ten years, new business formation activity in regions with high-productivity leads to a considerably larger subsequent employment growth than in regions categorized with a lower productivity level. In high-productivity regions, the coefficients for the start-up rates add up to 1.452 in the unrestricted model and 1.016 in the model with the Almon lags. In those regions with a medium-level of labor productivity, this sum amounts to 0.969 and 0.824, respectively (table 2). For the low-productivity regions, this effect is negative (-0.012 and -0.133).

Remarkably, the coefficients in the model with the Almon lags were not statistically significant at the five percent level for these regions. We can conclude from these results that the higher the productivity level of a region is, the more pronounced the employment increase that results from start-up activity will be.

There are several possible explanations for a relationship between the level of regional labor productivity and the size of the employment effects of new businesses. One reason for the observed pattern could be the competitiveness of the regional economy. If new businesses do not operate entirely on the regional market but also supply on the national and international market, the displacement effects are not necessarily restricted to the respective region but may well occur in other regions. Assuming that competition works according to a survival of the fittest scenario so that the displacement effect will predominantly challenge the low-productivity firms, the respective employment losses are more likely to occur in low-productivity regions as compared to regions with a higher productivity level. This implies that the regional employment effects of new business formation will particularly rely on the competitiveness of the incumbent firms in that region. Thus, high- and low-productivity regions differ with regard to the size of the displacement effects.

A second explanation for higher positive-employment effects of new businesses in high-productivity regions could be based on the embeddedness of new and incumbent establishments in their regional environments (Clark, Feldman and Gertler, 2003). They, particularly, depend on the qualification of the regional workforce as well as on the supply of other inputs in their region. The availability of high-productivity inputs in a region may not only have a positive effect on a firms' level of competitiveness but may also be conducive for realizing further improvements, i.e., innovation. This can pertain to all three effects of new businesses on regional employment but may be particularly relevant to the third-phase supply-side effects.

Thirdly, high-productivity regions have a higher share of start-ups in high-tech or in knowledge-intensive industries.<sup>7</sup> Cohort analyses of newly founded

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<sup>7</sup> The share of start-ups in knowledge-intensive industries in the 1998-2002 period is 35.2 percent in the high productivity regions, 30.0 percent in regions with medium labor productivity and 28.0 in the low productivity regions. The share of start-ups in high-tech industries on all manufacturing



businesses clearly show considerably larger employment growth in new businesses affiliated to such industries as compared to other sectors of the economy (Engel and Metzger, 2006; Weyh, 2006). Therefore, the direct employment effects of start-ups in high-tech and in knowledge-intensive industries should be relatively high. Moreover, innovative entries represent a larger challenge to the incumbents than non-innovative entries and will, therefore, have a stronger impact on the incumbents that should lead to relatively pronounced productivity enhancing supply-side effects.

The lag-structure of the different effects in high-, medium-, and low-productivity regions (figure 3) are in line with these interpretations. Our estimates clearly show that the negative displacement effects are most pronounced in the low-productivity regions while the employment effect in the second phase remains positive in the high-productivity regions. There is also a marked difference with regard to the supply-side effects according to the regional productivity level. While these supply-side effects appear to be negligible in the low-productivity regions, they are quite pronounced in the regions with medium- and high-productivity. The supply-side effects are a little larger for the high-productivity regions, but the difference to the medium-productivity regions is not very distinct. We also find a correspondence between the first phase employment effects and the regional productivity level. The higher the regional productivity level is, the larger the employment growth in the first years after start-up will be.

In summarizing our results, we can say that the effect of new business formation on employment growth tends to be considerably more pronounced in regions with a high density of economic activity. This indicates that a higher level of local competition leads to higher displacement and long-term supply-side effects. There is also a clear difference in the effects according to the level of regional labor productivity. The higher the regional productivity level is, the larger the positive-employment effects are. Our estimates for the low-productivity regions suggest that the overall result of new business formation for employment

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start-ups in high-, medium- and in low productivity regions is 11.8, 10.2 and 9.8 percent, respectively. For the classification of German industries see Grupp and Legler (2000) and BMBF (2005).

might be negative. Thus, stimulating new business formation may not be recommended as a growth strategy for all circumstances. Evidently, the effects of new businesses formation on economic development may be considerably shaped by regional conditions, particularly the productivity and competitiveness of the incumbents. This role of the regional context deserves further investigation in future analyses.

## **5. Conclusions for policy and further research**

The set-up of new businesses in a region may have positive as well as negative effects on the development of that region. These effects are, in a certain manner, distributed over time. The creation of new capacities leads to an increase of regional employment, however only for a short time. After a period of one or two years, there tends to be a declining effect on regional employment. We suppose that this decline results from the displacement of incumbents or the exit of new businesses which fail to be competitive. Competition and market selection may result in considerable improvements of competitiveness. We regard such positive supply-side effects as an explanation of rising employment that we observe between five to ten years after the new businesses have been started.

Performing the analysis for different types of regions shows that the magnitude of the effects of new business formation on regional development may be rather different. Obviously, the characteristics of the regional environment play an important role for the effects of new business formation. Further research should, therefore, focus on such differences and the importance of the regional environment. Our analysis suggests that regional density and the regional productivity may influence the effects. Regional characteristics affect not only the propensity to start a business (Fritsch and Falck, 2006) but also survival chances of new businesses (Fritsch, Brixy, and Falck, 2006; Engel and Metzger, 2006; Weyh, 2006) and their effects on regional development.

Policy should be well aware of the different effects of new businesses on regional employment and of the role of the regional environment. The regional level of labor productivity that seems to be important for the effects of new businesses is mainly shaped by the incumbent businesses and not by the new

firms, which tend to enter at a below-average productivity level (Bartelsman and Doms, 2000; Farinas and Ruano, 2005). Therefore, the presence of highly competitive incumbent firms can be regarded as an important prerequisite for a strong effect of new businesses formation in that region. Accordingly, a regional development policy should not completely disregard the incumbents and their role for transforming the impulses of new businesses into employment.

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## Appendix

*Table A1: Classification of West German planning regions according to the level of labor productivity*

<i>Level of productivity</i>	<i>Name of regions (number)</i>
High productivity (upper quartile)	Schleswig-Holstein Southwest (2), Hamburg (6), Bremen (11), Hannover (19), Brunswick (22), Dortmund (39), Duisburg/Essen (41), Duesseldorf (42), Bochum/Hagen (43), Cologne (44), Rhine-Main (51), Starkenburg (52), Rhine Hesse-Nahe (64), Rhine Palatinate (66), Lower Neckar (68), Stuttgart (72), Central Franconia (86), Munich (93)
Medium productivity (second and third quartile)	Schlewig-Holstein Center (3), Schleswig-Holstein East (4), Schleswig-Holstein South (5), Bremerhaven (13), Hamburg Hinterland South (14), Oldenburg (16), Emsland (17), Osnabruock (18), Suedheide (20), Lueneburg (21), Hildesheim (23), Goettingen (24), Paderborn (37), Emscher-Lippe (40), Muenster (35), Bielefeld (36), Arnsberg (38), Aachen (45), Bonn (46), Siegen (47), Northern Hesse (48), Central Hesse (49), Eastern Hesse (50), Central Rhine-Westerwald (62), Saar (67), Franconia (69), Middle Upper Rhine (70), Northern Black Forest (71), Eastern Wuerttemberg (73), Danube-Iller (BW) (74), Black Forest-Baar-Heuberg (76), Southern Upper Rhine (77), High Rhine-Lake Constance (78), Lake Constance-Upper Swabia (79), Bavarian Lower Main (80), Augsburg (88), Ingolstadt (89), Danube-Iller (BY) (94)
Low productivity (lower quartile)	Schleswig-Holstein North (1), Eastern Friesland (12), Bremen Hinterland (15), Treves (63), Western Palatinate (65), Neckar-Alb (75), Wuerzburg (81), Main-Rhoen (82), Upper Franconia West (83), Upper Franconia East (84), Upper Palatinate North (85), Western Central Franconia (87), Regensburg (90), Danube -Forest (91), Landshut (92), Allgaeu (95), Oberland (96), Southeastern Upper Bavaria (97)

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