

New Firms and Regional Employment Change

Michael Fritsch

ABSTRACT. This article analyzes the relationship between regional start-up activities and employment change in subsequent years for the West German planning regions. I find that the number of start-ups in a particular region is determined to a high degree by the prevalent sectoral structure. To eliminate this influence sectorially adjusted new-firm formation rates are calculated. These rates reflect a clear core-to-periphery decline. The relationship between the level of regional start-up activities and employment change comes out to be rather weak. In contrast to the common wisdom the coefficients for the impact of the entry rate on regional employment indicates a negative contribution of regional start-up activities.

1. Introduction¹

Setting up a new business establishment implies taking up new activities and it seems obvious that new establishments lead to an increase of job supply in a region. Therefore, it is a widely shared view that stimulating the founding of new firms will have a considerable positive impact on regional employment. However, there have been remarkably few attempts to empirically investigate the contribution that new firms make to regional employment so that we still know very little about the role of start-up activities in the job-generation process.

This paper analyzes the contribution of new establishments to regional employment change in West Germany. Section 2 summarizes the main hypotheses and the empirical evidence to be found in the literature. A short description of the data base (Section 3) is followed by a discussion of

alternative ways to form an entry rate (Section 4). Section 5 provides a comparison of these alternatives. Based on a short overview on regional differences in new-firm formation in West Germany during the period 1986–89 (Section 6), the relationship between new-firm formation and regional employment change in subsequent periods is analyzed in Section 7.

2. Hypotheses and empirical evidence

The contribution new firms make to employment in a certain region is quite unclear. In particular, we know only very little about the *relative* importance of new firm startup activities compared to the performance of already established units and the impact of firm exits. A number of arguments cast doubt on the common belief that new firms play a major role in the process of regional development:

First: Many new firms have to leave the market after only a short time so that their contribution to regional job supply is rather temporary (Brüderl and Schüssler, 1990; Brüderl, Preissendörfer and Ziegler, 1992).²

Second: Most new firms start quite small and a number of empirical studies show that only very few of the new firms generate substantial numbers of jobs (cf. Fritsch, 1990; König, 1994; Storey and Johnson, 1987).

Third: The impact of new establishments on regional employment depends critically on the consequences for the incumbents. If successful entry of newcomers forces incumbent firms to leave the market, or if entries are mainly induced by established firms assigning specific activities or jobs to other businesses (cf. Storey and

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Technical University Bergakademie Freiberg
Faculty of Economics and Business Administration
Gustav-Zeuner-Strasse 8
D-09596 Freiberg
Germany

Johnson, 1987), the effect of startups on regional job supply will be relatively limited. Moreover, to the extent that entries are associated with changes in the division of labor between establishments, this might result in rationalization effects and cause a reduction of employment. However, if such reorganization leads to an increase in regional competitiveness one should expect a positive impact on regional growth and employment, at least in the long run.

Fourth: It may be of central importance for the impact of a new establishments on regional employment:

- to what extent the newcomers receive their inputs from inside or from outside that region,
- to what degree the new establishments supply inputs to the regional economy that have been bought from outside beforehand, and
- whether the successful entry influences the regional economy in some other way, e.g. by reinforcing agglomeration economies or diseconomies.³

The first two of these objections aim at the *direct*-employment effects of new firms, i.e. new jobs that are created in the new establishments. The other two arguments concern influences that are more *indirect*. All of them suggest that the contribution of entries to regional employment is highly dependent on the characteristics of the new firms.⁴

Empirical analyses of the contribution of new firms to employment are rather rare. A possible reason for this lack in research may be the lack of appropriate data. Information on the number of new firms by region is available only in a few countries and often only from very recent sources (cf. Reynolds, Storey and Westhead, 1994). A severe shortcoming of nearly all such analyses is that they measure only the *direct* impact of new firms on employment and completely neglect the *indirect* effects. Those studies that try to estimate the direct-employment effects of new firms arrive at diverging results, depending on the region(s) and sector(s) studied and on the period of time under inspection. While, for example, Birch (1979) in his highly controversial analysis found a strong positive relationship between the number of jobs created by new firms and overall regional

employment change in the U.S.A., other studies (cf. Boeri and Cramer, 1992; Dunne, Roberts and Samuelson, 1989; Gerlach and Wagner, 1993; 1994; König, 1994; Hart and Hanvey, 1995) indicate that the performance of the surviving incumbent firms often has a higher impact on regional employment than the number of jobs created by the new firms. In many cases the number of firms that exit the market in a certain period is about as large as the number of entries so that the net change in the population of firms is relatively small when compared to the gross flows.⁵ Correspondingly, the positive direct-employment effects generated by the new firms are frequently more or less compensated by the negative effects due to the exit of firms.

Profound analyses of the relationship between new-firm formation and regional employment that account for the indirect effects have been carried out only recently and reflect diverging results. Reynolds and Maki (cf. Reynolds and Maki, 1990; Reynolds, 1994) for the U.S.A. arrive at the conclusion that there was a definite positive impact of the regional birth rate (number of new firms divided by the number of incumbent firms) on employment change in subsequent years. However, the intensity of this relationship varied considerably between time periods. Ashcroft and Love (1994) analyzed the impact of new-firm formation on regional employment change in Great Britain in the 1980s. They estimated that on average each case of gross-entry induced a net employment growth of about 4.1 jobs within the first four and a half years after the firm was founded. Davidsson, Lindmark and Olofsson (1994a, 1994b) related the birth rates for Swedish regions to indicators of economic well-being in subsequent years and found some positive coefficients. Remarkably, there was no statistically significant relationship between the entry rate and the change in unemployment.⁶ An analysis for the Netherlands (Economisch Instituut voor het midden- en kleinbedrijf, 1994, pp. 41–47) found no impact of the new-firm formation rate on regional employment change in subsequent years. Summarizing the empirical evidence it can be concluded that the importance of new firms for regional employment remains unclear.

3. Data base

The analyses presented here are based on 1986–89 data on new establishments in the West German planning regions. These data were generated by using social insurance statistics (for details Fritsch, 1992). The data contain only those establishments that have at least one employee working the minimum number of hours required for compulsory insurance contributions, i.e. they comprise no businesses entirely based on self-employment, family labor or marginal workers. In order to avoid large distortions due to errors in the data only those new establishments that had existed for at least one year and that had no more than 50 employees during the first two years were considered as start-ups.⁷ The analysis encompasses the start-ups of the years 1986–89. Although the data base is limited to the establishments, the new units are referred to as ‘firms’ to indicate that the focus is on business formation.

The regional basis for the analyses are the 75 planning regions (*‘Raumordnungsregionen’*) of West Germany. Figure 1 shows the common classification of West German planning regions according to their population density into agglomerations, moderately congested regions and rural areas.⁸

4. How to calculate entry rates

Regions often differ considerably in their economic potential (e.g. number of establishments and employees). Therefore, the absolute number of new firms may be no meaningful indicator for interregional comparisons of new-firm formation processes and an entry rate has to be determined.⁹ There are a number of alternative ways of how to calculate such a rate with regard to the measurement of new firms (Section 4.1), the choice of the reference figures (Section 4.2) and the question, of how to account for the effects of divergent sectoral structures in the regions (Section 4.3).

4.1. Measuring entries

The birth of firms can be measured in two ways. One alternative is to simply count the number of new firms, the other one is to weigh the newcomers by their size (e.g. by the number of

employees). Weighing the new firms by their size creates at least two problems: First, it is very difficult to identify new firms at all and in many cases, reliable information on their size is not available. Second, since at least some of the new firms develop quite dynamically within the early period of their existence, a specific point in time in relation to the date of birth would have to be determined so that size may be measured in a comparable manner. To avoid such problems the analyses presented here made use only of the information on the number of new firms regardless of their size.¹⁰

4.2. ‘Labor-market’ and ‘ecological’ approach

There are also alternatives concerning the denominator of the new-firm formation rate. One possibility for calculating an entry rate is to standardize the number of start-ups by the number of establishments that already exist in the respective region. In this case, the entry rate can be looked at as an indicator for the ‘fertility’ of the population of business establishments in the region (‘ecological’ approach). An alternative way of forming an entry rate is to divide the number of new firms by the regional workforce; this might be labeled the ‘labor-market’ approach. It is based on the notion that all members of the workforce are faced with the decision to work as dependent employees in someone else’s business or to start their own firm. Because start-ups are usually located near the founder’s residence (cf. Gudgin, 1978; O’Farrell, 1986), the regional workforce can be seen as an appropriate measure of the number of potential entrepreneurs. The entry rate according to the labor market approach may be interpreted as the propensity of a member of the regional workforce to start his or her own business.¹¹

The choice of the denominator for the entry rate does not only affect the results of empirical analyses of interregional differences in new firm formation (see Audretsch and Fritsch, 1994a and 1994b for details), but has also implications for analyses confined to specific sectors. If appropriate data are available, there is no problem in calculating the entry rate for certain industries according to the ecological approach. This is done by dividing the number of new firms in an industry

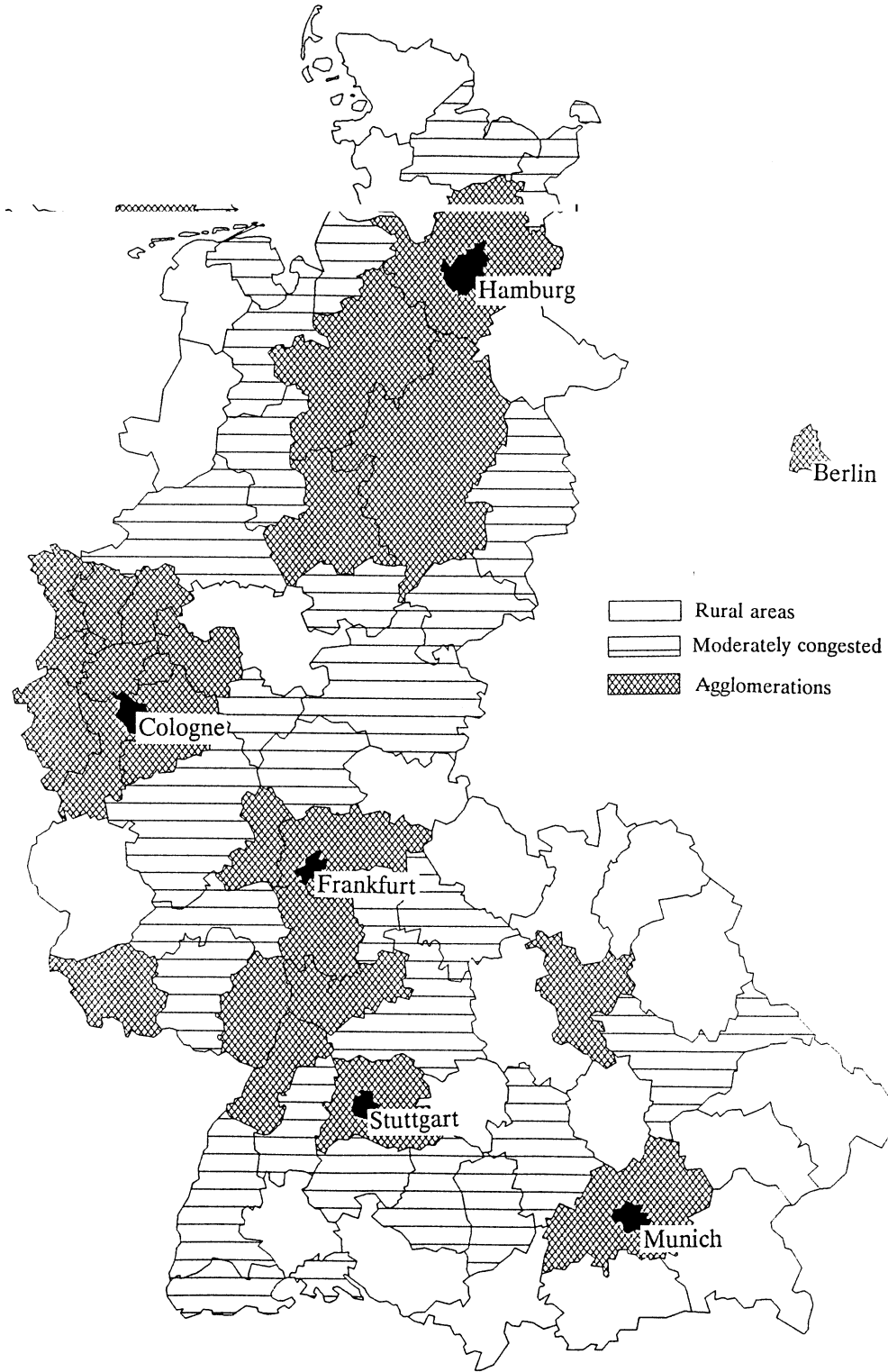


Fig. 1. Geographical distribution of West German planning regions.

by the number of incumbent firms in the same industry. Such an analysis becomes far more problematic when the labor-market approach is applied: One may divide the number of new firms in a specific industry by the number of employees in that particular industry, but it is not possible to unequivocally allocate the unemployed individuals to the different industries.¹²

4.3. Adjustment for effects of the sectoral structure

New-firm formation rates differ between industries for several reasons, e.g. diverging change of demand for the goods supplied or differences in barriers to entry. As a consequence, one may expect the sectoral structure of a region to have an effect on the region's entry rate: If there is a high share of establishments in industries which on average have a relatively high new-firm formation rate, the regional new-firm formation rate should also be relatively high. Vice versa, a high share of establishments in industries with a low entry rate should lead to a correspondingly low regional level of new-firm formation.

To account for such sectoral effects an adjusted entry rate is formed indicating the regional factor in founding activities according to a shift-share approach. In the first step of this procedure, the average entry rate in the industries is calculated on a national level. Since only the ecological approach allows for a meaningful differentiation by industry, the average entry rate is calculated as "number of new firms in industry *i*/number of establishments in industry *i*". In a second step, a *hypothetical number of entries* is determined for each region by multiplying the number of establishments in each industry by the average entry rate of that particular industry. This hypothetical number of start-ups tells us how many new firms in a region are to be expected according to its sectoral structure, provided the regional entry rate in the industries equals the national average. The *sector-adjusted number of entries* is then calculated by subtracting the hypothetical number of new firms from the actual number. To form an entry *rate* this figure can be related to different denominators, e.g. regional workforce or number of incumbent establishments. This sectorially adjusted entry rate permits determining the degree

to which new-firm formation in a region is above or below the national average when the effects of the sectoral structure are taken into account.

The analyses presented here use four alternative versions of a regional new-firm formation rate. They are formed by combining the actual and the sector-adjusted number of start-ups with the regional workforce and with the number of firms which already exist. Therefore, we have:

Entry rate A (labor market approach):

$$\frac{\text{number of new firms}}{\text{workforce}}$$

Entry rate B (ecological approach):

$$\frac{\text{number of new firms}}{\text{number of establishments}}$$

Entry rate A adjusted:

$$\frac{\text{number of new firms} - \text{hypothetical number of new firms}}{\text{workforce}}$$

Entry rate B adjusted:

$$\frac{\text{number of new firms} - \text{hypothetical number of new firms}}{\text{number of establishments}}$$

In the calculations reported here a classification into 55 private industries was used for estimating the hypothetical number of entries for all sectors. The estimations of the hypothetical number of entries in manufacturing are based on a division into 35 industries and for calculating the hypothetical number of new firms in the service sector a classification into 15 subsectors was utilized.

5. Comparing alternative new-firm formation rates

Comparing the actual number of entries with the hypothetical number of new firms reveals a high degree of agreement (Figure 2). In the calculations for all sectors the hypothetical number of new firms deviates from the actual number by no more than 10% in nearly 70% of all cases (regions). In about 85% of all cases the deviation is less than 15% (see Table I). The maximum deviation of the actual number of entries from the hypothetical one is -30% and + 35% with these cases being rare

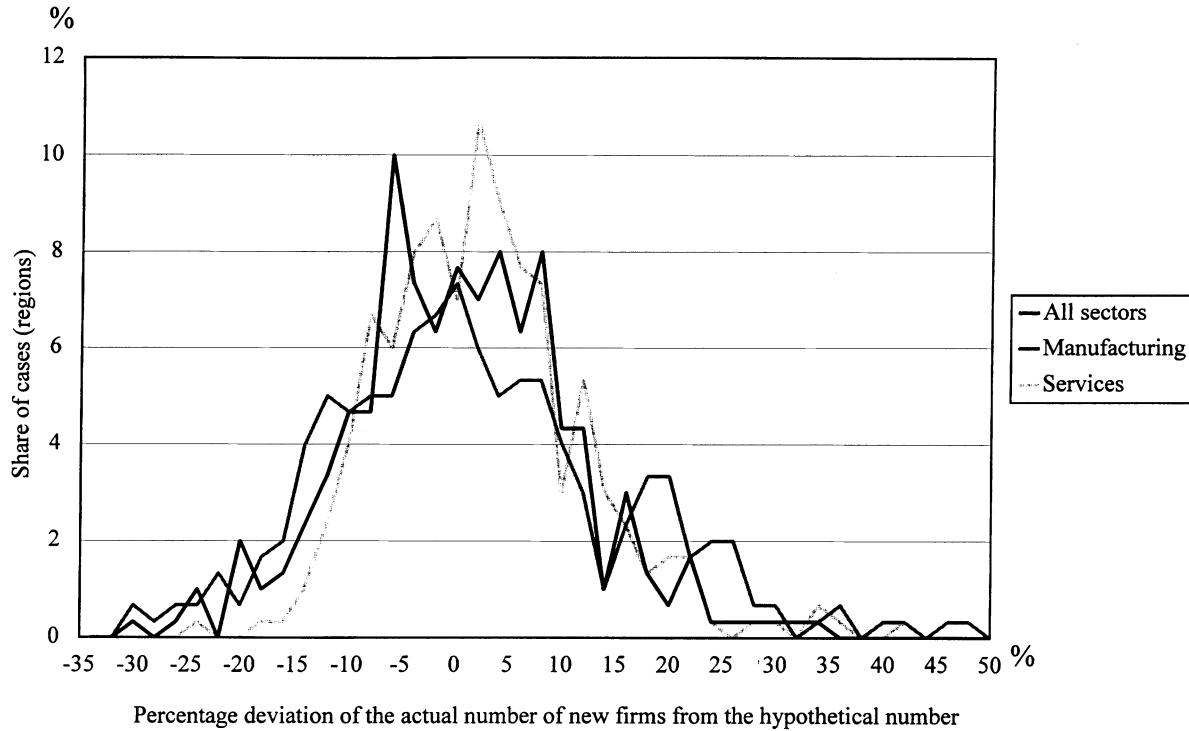


Fig. 2. Percentage deviation of the actual number of births from the hypothetical number in the West-German planning regions 1986–89.

TABLE I
Reference numbers for the dispersion of differences between actual and hypothetical number of new firms*

Deviation smaller than	All sectors	Manufacturing	Services
± 1%	7.6	7.3	7.0
± 5%	36.3	31.3	43.3
± 10%	69.6	57.6	75.0
± 15%	85.3	73.6	89.6

* Pooled birth rates for the years 1986–89 (N = 300). The table contains the percentage of cases (regions) for which the difference between the actual and the hypothetical number of new firms is below the level given in the first column.

exceptions as can be seen from Figure 2. For the average region the difference between the hypothetical and the actual number of entries amounts to about 10% of the hypothetical number, i.e. 90% of the regional start-ups can be explained by the sectoral structure of the respective region. Calculations limited to manufacturing and the service sector arrive at rather similar results.¹³

These comparisons of the hypothetical and the actual number of entries show clearly that the number of new firms set up in a region is largely determined by the sectoral structure in that region. Therefore, it seems to be important to account for the effects of the sectoral structure on the entry rate when analyzing interregional differences in new-firm formation. Without such an adjustment of entry rates there is great danger that the results reflect the differences in the sectoral structure rather than the differences in the level of founding-activities or entrepreneurship.¹⁴

Table II shows the correlation coefficients for the relationship between the entry rates in different definitions for all sectors as well as for manufacturing and services separately. The entry rates for all sectors are positively correlated with the lowest coefficients between entry rate A (labor market approach) and the sector-adjusted rates. The strongest correlation exists between the two sectorially adjusted entry rates. As can be seen in Table III there is a close statistical relationship between the entry rates for the different years

TABLE II
Correlations between the alternative new firm formation rates^c

Entry rate	B	A adjusted	B adjusted
<i>a: All sectors</i>			
A (labor market approach)	0.341 ^a	0.178 ^a	0.176 ^a
B (ecological approach)	–	0.709 ^a	0.730 ^a
A adjusted	–	–	0.984 ^a
<i>b: Manufacturing</i>			
A (labor market approach)	0.106	0.117 ^b	0.113 ^b
B (ecological approach)	–	0.923 ^a	0.963 ^a
A adjusted	–	–	0.964 ^a
<i>c: Services</i>			
A (labor market approach)	0.523 ^a	0.253 ^a	0.327 ^a
B (ecological approach)	–	0.752 ^a	0.774 ^a
A adjusted	–	–	0.985 ^a

^a Statistically significant at the 1%-level.

^b Statistically significant at the 5%-level.

^c Pooled data (N = 300).

Table III
Correlations of new firm formation rates in different years^a

Entry rate	Year t + 1	Year t + 2	Year t + 3
<i>a: All sectors</i>			
A (labor market)	0.847	0.871	0.877
B (ecological)	0.582	0.610	0.679
A adjusted	0.545	0.511	0.458
B adjusted	0.564	0.555	0.495
<i>b: Manufacturing</i>			
A (labor market)	0.794	0.762	0.762
B (ecological)	0.622	0.546	0.586
A adjusted	0.569	0.498	0.514
B adjusted	0.573	0.465	0.469
<i>c: Services</i>			
A (labor market)	0.716	0.867	0.857
B (ecological)	0.201	0.298	0.494
A adjusted	0.533	0.571	0.456
B adjusted	0.539	0.581	0.490

* Pooled data. Year t + 1: 225 cases; year t + 2: 150 cases; year t + 3: 75 cases. All coefficients are statistically significant at the 1%-level.

within the 1986–89 time period: Regions that are characterized by a relatively high birth rate in one year are very likely to exhibit a relatively high birth rate in the subsequent year. All coefficients of correlation for the relationship of regional entry rates in the different years show high positive

values and are statistically significant at the 1%-level. This indicates that the factors determining regional differences in new-firm formation are not subject to short-term variations but rather continue to be effective over time. It may be concluded that, to a high degree, new-firm formation rates rely on respective regional context conditions.

6. Survey of regional differences in new firm formation 1986–89

According to the definition of a new establishment used in the context of this paper (Section 3) there were about 121,000 to 135,000 new establishments founded per year in West Germany within the 1986–89 time period. This accounts for about eight to ten percent of the stock of all establishments at the beginning of the respective year. There are, however, considerable differences between economic sectors in this respect (Figure 3): The number of start-ups in relation to the stock of already existing firms (entry rate B) is considerably higher in the service sector than in manufacturing. There were, on average, 5.3 new firms per 1,000 members of the regional workforce in each year.

As can be seen from Figure 3, more than one half of all start-ups occurred in the highly congested regions. This concentration of the founding-activities in the agglomerations is probably a result of the larger economic potential there. The rural areas accounted for only 14% of the new firms. The overwhelming majority of new firms (68%) was in the service industries. The share of the service sector in the total number of new firms is relatively high (71.4%) in congested areas and lowest (60.6%) in rural areas. 62% of all new service-sector firms were founded in agglomerations; only 12% were in rural regions.

If the number of new firms is related to the regional workforce (entry rate A) we find a negative relationship between new firm formation and regional population density, i.e. the level of start-up activity is below-average in the agglomerations and relatively high for rural areas (Table IV). Standardizing the number of start-ups by the number of incumbent establishments (entry rate B) leads to exactly the opposite pattern: There is a positive relationship between new-firm formation and regional population density.¹⁵ The also

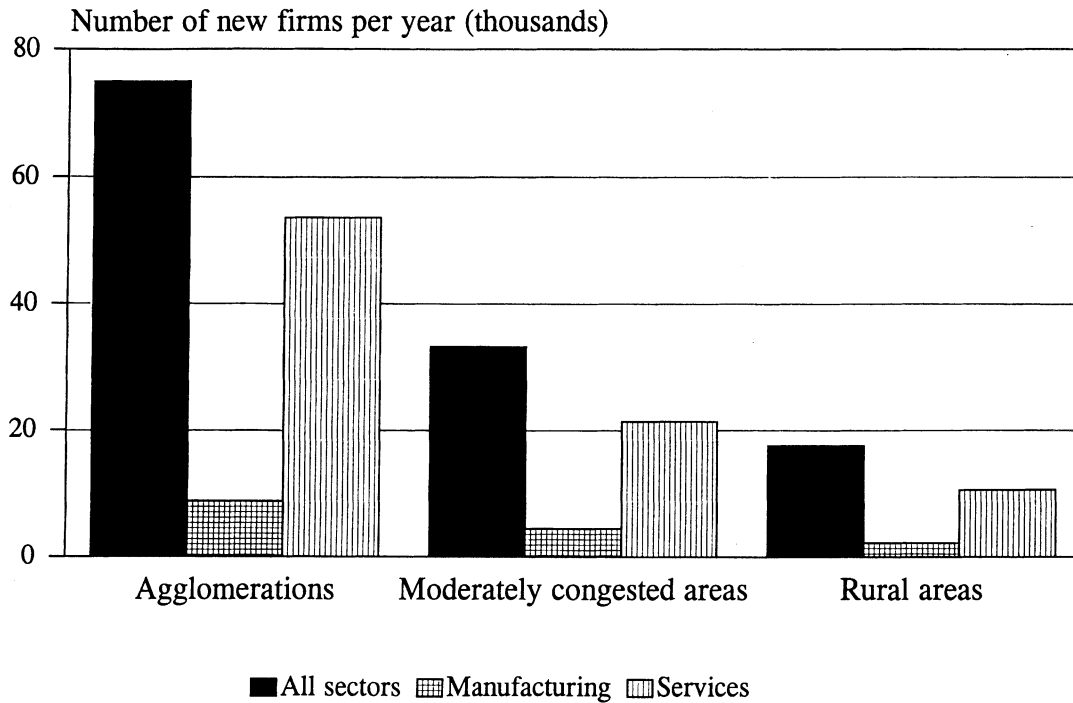


Fig 3. Average yearly number of new establishments by type of region.

TABLE IV
Correlations between the alternative new firm formation rates and regional population density^c

Entry rate	All sectors	Manufacturing	Services
A (labor market)	-0.234 ^a	-0.315 ^a	-0.016
B (ecological)	0.365 ^a	0.318 ^a	0.189 ^a
A adjusted	0.235 ^a	0.153 ^a	0.220 ^a
B adjusted	0.280 ^a	0.223 ^a	0.240 ^a

^a Coefficient statistically significant at the 1%-level.

^b Coefficient statistically significant at the 5%-level.

^c Pooled data (N = 300).

positive correlation coefficients between the sector-adjusted entry rates and population density indicate that the level of new-firm formation activity is clearly above the average in the agglomerations while we find negative deviations from the number of start-ups expected in the rural areas. There is obviously a clear core-periphery downward trend in founding activities if entry rates account for the effect of a region's sectoral structure.

7. The impact of new-firm formation activities on regional employment

Is there an identifiable link between new-firm formation activities and regional employment change in subsequent years?

Though regional employment may be determined by a number of factors other than new firm formation, some kind of multivariate analysis would be desirable to test the relative importance of entry rates for changes in the number of jobs supplied. However, attempts to identify such variables have not been successful, i.e. no meaningful approach to explain regional employment change in West German planning regions by factors such as regional labor market conditions (e.g. qualification of the regional workforce, regional wage level, unemployment rate), industry structure, per-capita income, establishment-size structure or degree of agglomeration could be found.¹⁶ Therefore, in order to account for unobserved region-specific effects on employment change regressions were estimated, in which the birth rate and a dummy variable for each planning region

(all together 74 regional dummy variables) were included as explanatory variables. Table V shows the beta-coefficients for the influence of the entry rate in various definitions on employment change and the adjusted R^2 for the respective regression model.¹⁷ The coefficients for the regional dummy variables are omitted due to space limitations.

In the calculations for all sectors many of the coefficients and of the regression equations prove to be statistically significant. While there seems to be a clear positive relationship between entry rate and employment change in year 0, the period when the start-up occurs, the impact of new firm formation on employment change turns out to be negative in the subsequent years $t + 1$ and $t + 2$. For year $t + 3$ the unadjusted entry rates indicate a positive relationship between entry and employment change but we find negative signs for the adjusted rates with relatively high and statistically significant values of the respective beta-coefficients. The results for year $t + 4$ are also contradictory, however, the respective coefficients are small and not significant. The estimates for the regressions limited to start ups in the manufac-

turing sector reflect a rather diffuse picture showing positive as well as negative values for the impact of entry on employment change in a certain year. We find a statistically significant negative sign for the relationship between entry rate A and employment change in year $t + 1$ and $t + 2$, however, in those cases where the beta-coefficients show a positive value they are not statistically significant. In the service sector three of the four alternative entry indicators have a statistically significant positive sign for the relationship between new firm formation and regional employment change in year 0. All the other coefficients that prove to be statistically significant show a negative sign here.

All in all, it can be concluded that there is a somewhat positive impact of new firm formation on regional employment in the year where the new businesses are set up, but that the relationship between entry and regional employment change in subsequent periods is negative. This finding is in sharp contrast to common wisdom that is based on the fact that new firms obviously create new jobs. The most plausible explanation for this seemingly

TABLE V
Beta-coefficients for the relationship between entry rates and employment change^e

Entry rate	Employment change (%)				
	Year 0	Year $t + 1$	Year $t + 2$	Year $t + 3$	Year $t + 4$
<i>a: All sectors</i>					
A	0.323 ^b (0.251 ^c)	-0.972 ^a (0.191 ^c)	-0.943 ^a (0.104 ^d)	0.332 (0.029)	0.079 (0.514 ^c)
B	0.071 (0.236 ^c)	-0.781 ^a (0.217 ^c)	-0.530 ^a (0.056)	0.320 ^a (0.001)	0.035 (0.514 ^c)
A adj.	0.267 ^a (0.272 ^c)	-0.095 (0.050)	-0.391 ^a (0.017)	-0.640 ^a (0.202 ^c)	-0.042 (0.514 ^c)
B adj.	0.292 ^a (0.278 ^d)	-0.119 (0.048)	-0.422 ^a (0.026)	-0.649 ^a (0.202 ^d)	-0.059 (0.576 ^d)
<i>b: Manufacturing</i>					
A	-0.008 (0.133 ^c)	-0.400 ^a (0.145 ^c)	-0.386 ^a (0.083)	-0.175 (0.156)	0.121 (0.229)
B	-0.001 (0.133 ^c)	-0.058 (0.108 ^d)	0.039 (0.118)	-0.001 (0.163)	0.280 (0.192)
A adj.	0.011 (0.133 ^c)	0.036 (0.107 ^d)	0.052 (0.118)	0.068 (0.161)	-0.046 (0.230)
B adj.	-0.003 (0.133 ^d)	0.034 (0.107 ^c)	0.082 (0.116)	0.072 (0.160)	0.018 (0.231)
<i>c: Services</i>					
A	0.766 ^a (0.132 ^c)	-0.396 ^a (0.022)	-0.640 ^a (0.064)	0.492 ^a (0.013)	-0.108 (0.467 ^c)
B	-0.054 (0.011)	-0.296 ^a (0.025)	-0.314 ^a (0.059)	-0.107 (0.071)	-0.041 (0.464 ^c)
A adj.	0.264 ^a (0.018)	0.057 (0.059)	0.021 (0.038)	-0.098 (0.077)	0.000 (0.463 ^c)
B adj.	0.241 ^b (0.012)	0.056 (0.060)	0.030 (0.038)	-0.079 (0.079)	0.057 (0.464 ^d)

^a Coefficient statistically significant at the 1%-level.

^b Coefficient statistically significant at the 5%-level.

^c Regression model statistically significant at the 1%-level.

^d Regression model statistically significant at the 5%-level.

^e Results of regressions with regional dummy-variables (adjusted R^2 values for the whole equation in parantheses).

contradictory phenomenon may be simply that, during the period under examination, the positive impact of new firms on regional employment change has been overcompensated for by other factors. Presumably, many of the new service firms represent an element of a reorganization process in which activities and jobs are allocated to the establishments within and outside the respective region in a different way.¹⁸

8. Conclusions

The results of the analyses presented here suggest a number of conclusions for future research and for economic policy.

It was demonstrated that the number of start-ups in a region is highly influenced by the sectoral structure in that region and that much more than half of the number of start-ups can be 'explained' by the sectoral structure. Consequently, interregional comparisons of new-firm formation should account for this influence and operate with sectorially adjusted entry rates. The results of the relationship between new firm formation and regional employment change are well suited to question the stimulation of new firm formation as a strategy for a policy aimed at promoting regional employment growth. This concerns particularly non-specific forms of such a policy which try to promote all kinds of new firms. Policies that are aimed at stimulating economic development by promoting new firm formation should be selective and try to concentrate on job-generating start-ups. The results indicate that, at least for West Germany during the period of analysis, new firms obviously have been far less important for regional employment than is commonly assumed. Therefore, the endogenous potential of the regions, i.e., the incumbent firms, should not be neglected.

Notes

¹ Two anonymous referees provided a number of very helpful suggestions for improvements.

² Boeri and Cramer (1992) analyzed the job development in cohorts of newly founded West German establishments over a ten year period of time and found, that the number of jobs in these cohorts at the end of this period was in many cases smaller than at the time these establishments have been set up. The maximum number of jobs in a cohort of new establishments was normally attained in the second year. The decrease

in the number of jobs in the later years is mainly due to exits from the market. According to Boeri and Cramer only about 40% of all newly founded establishments survived the first ten years. The average number of jobs in the surviving units was 6.1 employees.

³ If a newcomer has only a low rate of value added, receives large amounts of inputs from outside the region and is crowding out a competitor that bought his input mainly from regional suppliers, then the setting up of a new establishment leads to decrease in the regional supply of jobs.

⁴ Cf. the empirical studies by Storey, Keasey, Watson and Wynarczyk, 1987; Storey *et al.*, 1989; Brüderl, Bühler and Ziegler, 1993; Barkham, 1994.

⁵ For the relationship between firm births and deaths see Audretsch and Fritsch, 1996; Fritsch, 1996; Keeble and Walker, 1994.

⁶ Davidsson, Lindmark and Olofsson (1994a, 1994b) give no information on the relationship between the new firm formation rate and regional employment change.

⁷ Most of the new establishments recorded by the social insurance statistics are very small: In the 1986–89 time period more than 80% had fewer than ten employees and more than 90% had fewer than 50. But there were also several establishment-numbers new to the data set in a certain year with more than 100 employees. It can be assumed that these establishments were new branch plants of large firms, that they reflect errors in the social insurance statistics or that in these cases the identification number changed for non-economic reasons. Because the analysis did not focus on new branch plants but rather on new firms, which usually start off as relatively small establishments, new identification numbers representing establishments with 50 or more employees were not considered to indicate the founding of an enterprise. However, omitting this cut-off criterion or modifying the number of employees from which on a new identification number is not considered to indicate the setting up of a new enterprise may lead to a different number of startups in a region but does not change the results of the analysis in any significant way.

⁸ The West German planning regions are based on smaller administrative subunits ('*Kreise*') that are aggregated according to the functional relationship between them. Each planning region consists of at least one core city and the respective suburban ring. Although planning regions are somewhat larger than the official labor market regions, many of them may be seen as a plausible approximation of regional labor markets. The subunits, on the other hand, are much smaller than regional labor markets.

⁹ In order to avoid the calculation of entry rates Harhoff (1995) in his analysis of regional differences of new firm formation chose the absolute number of startups as the dependent variable and related it to (among other independent variables) the absolute number of establishments as well as to the absolute number of employees. However, this is not a convincing solution to the problem of accounting for different economic potentials in an interregional comparison because the introduction of a variable for agglomeration effects (e.g. population density) in a regression that already contains the number of employees would obviously lead to considerable multicollinearity. We know from empirical work (for a survey see Reynolds, Storey and Westhead, 1994) that such agglom-

eration effects have a significant influence on new firm formation processes, i.e. that a high degree of agglomeration is conducive to the formation of new businesses.

¹⁰ One reason for not using the information on the size of the new establishments is that many of those cases that represent errors in the social insurance statistics are larger units. Therefore, if new establishments would be weighed by their size, the error in the data caused by questionable cases would be much more severe compared to analyses that are based on the number of new establishments.

¹¹ Note that the definition of an entry rate in the way described here does not necessarily imply the assumption that there is a linear relationship between the number of new firms and the number of incumbents or the size of the regional workforce. In fact, if a high degree of agglomeration is conducive to new firm formation, then a nonlinear relationship between the number of startups and the size of the regional workforce is to be expected.

¹² One solution to that problem would be to allocate the unemployed to the different industries according to the employment share of the industries in the respective region. However, such a procedure would be quite problematic, though, since there are large differences with respect to the employment performance of industries; consequently they do not all contribute to unemployment to the same degree.

¹³ In addition to manufacturing and services the calculation for all sectors comprise agriculture, mining, energy and construction.

¹⁴ However, empirical tests with these sector-adjusted entry rates lead to the same variables that determine regional differences in new firm formation than are found on the basis of non-sectorially adjusted rates.

¹⁵ The reason for this difference obviously lies in the fact that agglomerations exhibit a higher average establishment-size and therefore a larger number of potential founders is involved with each business. For a more detailed analysis see Audretsch and Fritsch (1994a, 1994b).

¹⁶ This corresponds to the results of a study by Bade (1991), who tried to explain and to predict employment change in the West German planning regions by all kinds of socio-economic factors and did not find any reasonable estimate.

¹⁷ The data on employment were also taken from social insurance statistics.

¹⁸ The analyses for certain sectors did not yield clear sector-specific patterns in the relationship between entries and economic growth. An exception were calculations restricted to certain 'high-tech' sectors that showed a relatively strong positive link between entries and regional employment change during periods to follow. It might be concluded that start-ups in these sectors are more likely to survive and generate a considerable number of jobs than do new firms in other sectors. However, even in 'high-tech' sectors many new firms fail or stay small so that – as is the case in all sectors – fast growing firms are a rare exception. Therefore, the sector a new firm belongs to is not an adequate criterion to identify job-generating start-ups with any certainty.

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