

How Large are the Direct Employment Effects of New Businesses? An Empirical Investigation for West Germany

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ABSTRACT. We analyze the development of employment in start-up cohorts, which is the direct gross employment effect of the new businesses. The data is for West Germany and covers the 1984–2002 period. While total employment in the cohorts remains above the initial level in manufacturing, we find a pronounced decline of employment below this level in the service sector. Only a small fraction of the firms create a considerable amount of jobs. The contribution that the start-up cohorts of the 1984–2002 period made to total employment in 2002 is nearly three times as high in services as in manufacturing.

KEY WORDS: employment change, new firms, start-up cohorts.

JEL CLASSIFICATION: D21, L10, L29, M13

1. Introduction

Politicians are apt to believe that new firms make a significant contribution to economic development. If this assertion is correct, then

stimulating the emergence of new firms could be a powerful means for creating employment. However, the magnitude of the employment effect of new firm formation is rather unclear. Also, little is known about the nature of the link between new firm formation and employment. What is the relative importance of the employment that is generated in the new businesses as compared to the other effects of entry? There are two categories of such other effects that the setup of new businesses may have on employment (for a more detailed characterization of the different effects see Fritsch and Mueller, 2004). One of these categories is the crowding out of incumbents that leads to decline or closure. The other type of effect is an improvement of the market supply due to increased competition.

This paper investigates the evolution of employment in cohorts of newly founded businesses that can be termed the ‘direct gross employment effect’ of new firms. Because we do not account for the crowding-out of employment in incumbent businesses nor for supply-side effects our results tell only a part of the whole story. But this part may have important implications. In the case that we find the newly founded businesses create only a relatively small amount of jobs, this would mean that a great positive impact of new firm formation on employment could only result from the indirect supply-side effects. However, if our analysis would show rapid employment growth in entry cohorts, this would not necessarily prove a strong impact of new firm formation on employment because the gross effect does not account for crowding out of employment in the incumbent businesses.

Compared to earlier studies of the evolution of start-up cohorts, our analysis provides two

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main advantages that make it unique. First, while many of the available studies are limited to certain industries or broad economic sectors (Baldwin, 1995; Carroll and Hannan, 2000; Disney, Haskel and Heden, 2003; Wagner, 1994) our data covers the private sector rather comprehensively. We can therefore investigate for differences between the large economic sectors, namely manufacturing and services. Secondly, we are able to follow the cohorts over a rather long period of up to 18 years. While some of the available studies have investigated the survival of new organizations in certain industries for much longer periods (Carroll and Hannan, 2000), we know of no other analysis that investigates the development of employment in start-up cohorts over such a long time.

The paper is organized as follows: Based a brief review of the evidence (Section 2) we introduce our data and discuss measurement issues (Section 3). Section 4 provides an overview of new firm formation in our data during the period of analysis. Section 5 analyses survival and employment in entry cohorts over time. We then examine the size distribution of the new businesses and the concentration of the new employment (Section 6) and assess the contribution of the different entry cohorts to employment in the most recent year of our dataset (Section 7). Finally, the main implications of our findings are discussed (Section 8). The analysis is based on data for West Germany in the period 1984–2002.

2. Review of the evidence

The evolution of employment in start-up cohorts is characterized by two main effects. On the one hand, a considerable fraction of the new businesses fail and have to exit the market rather quickly. On the other hand, the surviving new businesses may grow and create jobs. The resulting net-effect depends on the magnitude of these two developments.

Empirical studies have shown that new firms are characterized by a relatively high risk of failure during the first years of their existence.¹ Main reasons for such a *liability of newness* are the problems of setting up an organizational structure and getting the new unit to work effi-

ciently enough to hold pace with competitors. This particularly includes establishing relationships with customers and suppliers as well as acquiring suitable personnel. Another reason for the relatively high vulnerability of entries for closure is that many of the new businesses have to survive a considerable period of time before they are able to achieve their first profit. Because new firms tend to start off relatively small, the liability of newness may as well be a *liability of smallness* (Aldrich and Auster, 1986). Such a vulnerability of small units for closure could be explained by a rather limited endowment of resources, allowing them few chances to survive economic problems. Some authors also assume that older firms are facing a relatively high likelihood of being closed down. The reason for such a *liability of aging* could be sclerotic inflexibility of old established organizations (*liability of senescence*), an erosion of technology, products, business concepts and management strategies over time (*liability of obsolescence*) or, particularly in the case of owner-managed firms, problems of finding a successor who is willing to take over the business.² The notion of a liability of aging is not necessarily a contradiction to the concept of liability of newness because both phenomena relate to quite different developmental stages of a firm, namely early “youth” and “maturity”. The time span of available data on start-up cohorts is, however, too short for detecting such an ‘old age’ phenomenon.

While there are a number of studies available that investigate the survival chances of newly founded businesses, empirical analyses of the development of employment in start-up cohorts are rare. Storey (1994, pp. 113–119), in reviewing the studies that were available until the early 1990s, emphasizes that only a rather small proportion of the new businesses do create considerable amounts of jobs.³ Boeri and Cramer (1992), in an analysis for West Germany in the period 1977–1990, found that the number of employees in a certain cohort rises only in the first year and then soon declines. In two of the three cohorts that Boeri and Cramer (1992) follow over a longer period of time, cohort employment tends to be below the initial level from the third year on. It then stays fairly

constant at about 93% of the initial level until the tenth or eleventh year, the end of Boeri and Cramer's observation period. In this period of constant cohort employment the employment losses due to exits are more or less counterbalanced by employment gains in surviving firms. In the third of the three cohorts a slight decrease of employment below the initial level occurs only after 7 years. All three cohorts experience an increase of employment in the last year of the observation period. Because this last year falls in the period of German unification⁴, the rise of cohort employment may be caused by special developments in this specific time period. Based on a four cohorts of new manufacturing firms set up in the German federal state of Lower Saxony between 1979 and 1983, Wagner (1994, p. 144) finds an initial increase of employment in three of the cohorts followed by a decline below the initial level. After about 5 years, however, cohort employment tends to rise again slightly exceeding the initial level in two of the four cohorts. The maximum observation period of Wagner's analysis is 11 years.

Brixy and Grotz (2004), using the same database as Boeri and Cramer (1992) for a different time period (1991–2000), also showed that employment in entry cohorts first rises but then declines from the second or third year on. After a period of 10 years, employment in the West German cohorts falls slightly below the initial level (Brixy and Grotz, 2004, p. 150). Employment in East German entry cohorts also rises first and then declines again. However, the new businesses which have been set up in the year 1991, a very early phase of the transformation process, had much higher survival rates and greater employment growth than the entries that occurred in later years. While the East German start-up cohort of the year 1991 had about 60% more employees in the year 2000 than at the time the firms started, later cohorts quickly adjusted to the pattern that was found in all other studies for West Germany (Brixy and Grotz; 2004; see also Fritsch 2004). However, also in this outstanding 1991 cohort of East German start-ups, overall employment reached a maximum after 3 years and then started to decline again. This suggests that an overall pattern of employment in start-up cohorts exists but that

the magnitude of effects may be considerably affected by the general economic conditions at the time of founding. Differences of the employment development in start-up cohorts have also been found between industries (cf. Boeri and Cramer, 1992; Brixy and Grotz, 2004).

3. Data and measurement

Our information on the evolution of start-up cohorts and on overall employment is taken from the establishment file of the German Social Insurance Statistics, as described and documented by Fritsch and Brixy (2004). This database provides information about all establishments that have at least one employee who is subject to obligatory social insurance. New entities with more than 20 employees in the first year of their existence are not classified as start-ups.⁵ As a result, a considerable number of new subsidiaries of large firms are not included in the start up-cohorts. A detailed analysis of our database reveals that these data do reflect the new firm formation activity relatively well (Brixy and Fritsch, 2002; Fritsch, et al. 2002). Currently, the information on West Germany is available for the period 1984–2002. We analyze survival and evolution of employment in the 18 yearly cohorts of new businesses that have been founded in that time span. Compared to analyses of the same database (Boeri and Cramer, 1992; Brixy and Grotz, 2004; see Section 2) we investigate yearly employment in the entry cohorts over a much longer period of time.

We perform the analysis for all private sector industries taken together as well as for manufacturing and services separately.⁶ Because the database records only businesses with at least one employee other than the owner, start-ups without any employees are not included. This leads to a slight underestimation of the direct contribution of new business formation to employment. However, new businesses enter the database as soon as they have their first employee.⁷

Despite the variance in the development of the entry cohorts that exists between years (Figures 1–3, Tables I–III), a general pattern can be identified that holds for all the vintages of

TABLE I
Number of start-ups, initial employment and initial size in yearly cohorts 1984–2002 – all private sector industries

Year	Number of start-ups	Initial employment	Average initial size	Share of start-ups with more than one employee (%)
1984	117,519	255,414	2.17	36.74
1985	117,765	255,531	2.17	36.67
1986	116,406	255,127	2.19	37.08
1987	116,173	252,386	2.17	37.20
1988	121,083	266,299	2.20	37.42
1989	119,604	267,220	2.23	38.01
1990	130,801	294,653	2.25	38.68
1991	135,985	309,440	2.28	39.12
1992	136,123	314,253	2.31	39.71
1993	132,521	311,061	2.35	40.42
1994	129,975	316,865	2.44	42.25
1995	128,911	304,708	2.36	40.85
1996	129,942	305,666	2.35	40.36
1997	128,950	308,479	2.39	40.91
1998	137,756	313,039	2.27	41.13
1999	178,098	384,104	2.16	38.69
2000	165,565	374,213	2.26	39.82
2001	142,154	331,965	2.34	41.06
2002	141,097	344,085	2.44	43.08
Average	132,970	303,395	2.28	39.43
Standard Deviation	16,148	38,591	0.09	1.91

TABLE II
Number of start-ups, initial employment and initial size in yearly cohorts 1984–2002 – manufacturing

Year	Number of start-ups	Initial employment	Average initial size	Share of start-ups with more than one employee (%)
1984	14,015	39,907	2.85	46.41
1985	14,376	40,383	2.81	46.46
1986	14,626	41,244	2.82	46.97
1987	14,061	38,476	2.74	45.64
1988	14,543	40,981	2.82	46.70
1989	14,458	42,435	2.94	47.24
1990	15,354	44,065	2.87	47.67
1991	15,765	46,034	2.92	47.83
1992	15,005	42,949	2.86	46.80
1993	14,243	41,269	2.90	47.02
1994	13,133	41,109	3.13	50.92
1995	13,294	40,177	3.02	49.67
1996	13,552	38,751	2.86	47.00
1997	13,261	39,074	2.95	48.22
1998	14,548	45,387	3.12	47.09
1999	16,652	50,196	3.01	45.81
2000	15,235	47,431	3.11	45.40
2001	14,912	41,470	2.78	41.60
2002	14,748	43,361	2.94	43.22
Average	14,515	42,352	2.92	46.72
Standard deviation	890	3,112	0.12	2.02

TABLE III
Number of start-ups, initial employment and initial size in yearly cohorts 1984–2002 – services

Year	Number of start-ups	Initial employment	Average initial size	Share of start-ups with more than one employee (%)
1984	82,388	170,582	2.07	36.92
1985	83,102	170,655	2.05	36.50
1986	83,242	172,554	2.07	36.59
1987	85,232	175,990	2.07	36.58
1988	89,731	185,843	2.07	36.18
1989	88,918	186,527	2.10	36.88
1990	96,841	205,716	2.12	37.30
1991	100,870	217,516	2.16	38.09
1992	100,914	220,489	2.19	38.33
1993	99,804	221,403	2.22	38.95
1994	98,421	225,100	2.29	40.28
1995	96,031	212,287	2.21	38.40
1996	97,214	215,338	2.22	38.40
1997	96,081	218,439	2.27	39.24
1998	102,102	215,742	2.11	39.72
1999	137,675	272,744	1.98	37.20
2000	127,242	270,736	2.13	38.53
2001	107,541	244,832	2.28	41.05
2002	107,343	253,890	2.37	43.08
Average	98,984	213,493	2.16	38.33
Standard deviation	14,207	31,631	0.10	1.79

our sample. In order to identify the general development patterns of entry cohorts we aggregate the 18 yearly cohorts and calculate average values. We focus on general development patterns and will therefore only briefly discuss the variation between the yearly cohorts.

A cohort's survival rate s is defined as the share of new businesses that survived up to a certain year after their foundation. If the 'life-time' of a start-up is described by t , then the distribution of survival rates is given by $s(t)$ with the density function $f(t)$. The hazard rate h is defined as the share of new businesses which have been closed in a year t under the prerequisite that they have survived until $t-1$. It is given by

$$h(t) = \frac{f(t)}{s(t)} \quad (1)$$

Both the hazard rate and the survival rate describe the same phenomenon in different ways. The close link between the two rates can be described using the cumulative hazard rate $H(t)$, which is the sum of all hazard rates for the periods up to and including t . The cumulative

hazard rate gives the probability of failure in the time span between the founding of a new business and the end of the period t . The relationship between the cumulative hazard rate and the survival rate is given by

$$H(t) = -\log(s(t)). \quad (2)$$

Other indicators used for describing the development of entry cohorts are the number of employees at different percentiles of the size distribution and the concentration of employment in the largest businesses of the cohort. To assess the direct gross employment effect of new businesses we calculate the employment share of the different yearly start-up cohorts in total employment at the end of our period of analysis, the year 2002.

4. New firm formation in West Germany 1984–2002

Tables I–III show the number of start-ups, initial employment, average initial size as well as the share of start-ups with more than one employee in the first year for the yearly cohorts.

According to these figures, about 133,000 new establishments had been set up each year. This represents approximately 9.5% of all private sector businesses that existed in the respective year. Exit rates tend to be in about the same range so that the change in the number of businesses is relatively small in most industries. Over the years the number of start-ups increased with a relatively distinct rise between 1990 and 1991 and after 1997. The majority of the new businesses, nearly 99,000 per year (74.4% of all start-ups), were in the service sector compared to about 14,500 new establishments per year (10.9%) in manufacturing. There was an overall tendency towards an increasing share of start-ups in the service sector and a corresponding decreasing share in manufacturing. The number of start-ups in the other private sector industries for which we do not explicitly report here remained reasonably constant.⁸

In nearly all of the cohorts and years, the majority of the new businesses have no more than one employee at the time they are first registered in our database.⁹ For the private sector as a whole the average share of start-ups with more than one employee is 39.43% (Table I). In manufacturing this figure is considerably higher (46.72%; Table II) than in services (38.33%; Table III). In manufacturing, 5% of the new businesses have eleven or more employees. In services, the largest 5% of the start-ups have at least seven employees. There is a tendency towards a higher share of start-ups with more than one employee in services, which is also reflected in the figures for all private sectors. However, such a development cannot be found for the start-up cohorts in manufacturing. In all three sectoral definitions the average initial size of the new businesses follows a trend towards more employees.

The increasing initial employment of the entry cohorts that can be observed over the years is mainly a result of the rising number of start-ups. A regression model with initial employment as the dependent variable and the number of start-ups as the independent variable yields an R^2 of 0.90 for the private sector as a whole and 0.71 and 0.89 for manufacturing and for services, respectively. An impact of the increasing aver-

age size on initial employment of entry cohorts could particularly be found for the entries into manufacturing.¹⁰ For services and for the private sector as a whole it is not statistically significant at the 5% level.

5. Survival and employment in start-up cohorts

Even if the great majority of new businesses start out rather small, a part of the newcomers will grow. Therefore, any assessment of the employment effects of new firm formation has to account for this development in the years that follow the market entry. This evolution of employment in a cohort of new businesses has two main determinants, which are survival and growth. Figure 1 shows the evolution of employment as well as the hazard and the survival rates in the different entry cohorts. The thin dotted lines in Figure 1 represent the individual cohorts and the thicker line gives the average value over all those cohorts for which information in the respective year exists. The thin lines have different lengths according to the diverging extent of the observation period.¹¹ Thus, the shorter lines represent the more recent entry cohorts and the longest line gives the values for our earliest cohort, the businesses which have been set up in the year 1984. In order to compare the pattern of the employment development between cohorts, the number of employees is expressed as an index with initial employment, i.e. the number of employees in the year in which the businesses have been set up, being set at 100%.

Figure 1 reveals considerable variation between the entry cohorts in terms of employment development. In particular, the start-up cohorts of the 1980s, represented by the longer lines in Figure 1, tend to be more successful in terms of employment than the start-up cohorts of later years, given by the shorter lines. There is, however, a quite clear general trend that is well represented by the curve for average employment. Looking at the evolution of average employment in entry cohorts for all private sector industries (Figure 1), we find that the number of employees first grows above the initial level. But after having reached a peak after one year, employment soon starts to decline again. After about 8 years it falls under the initial level

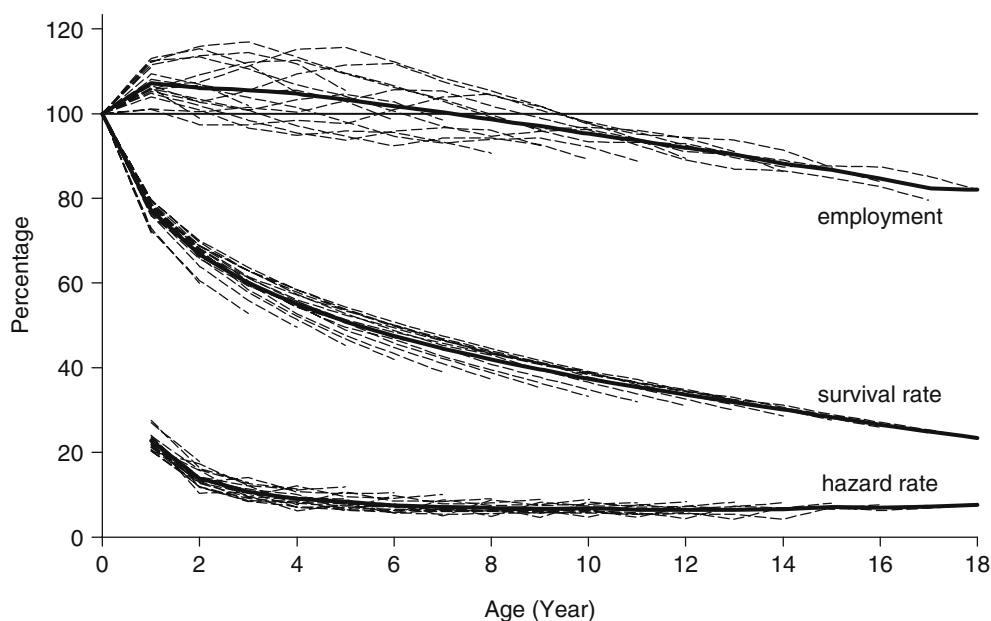


Figure 1. Evolution of employment, survival rates and hazard rates in entry cohorts – all private sector industries.

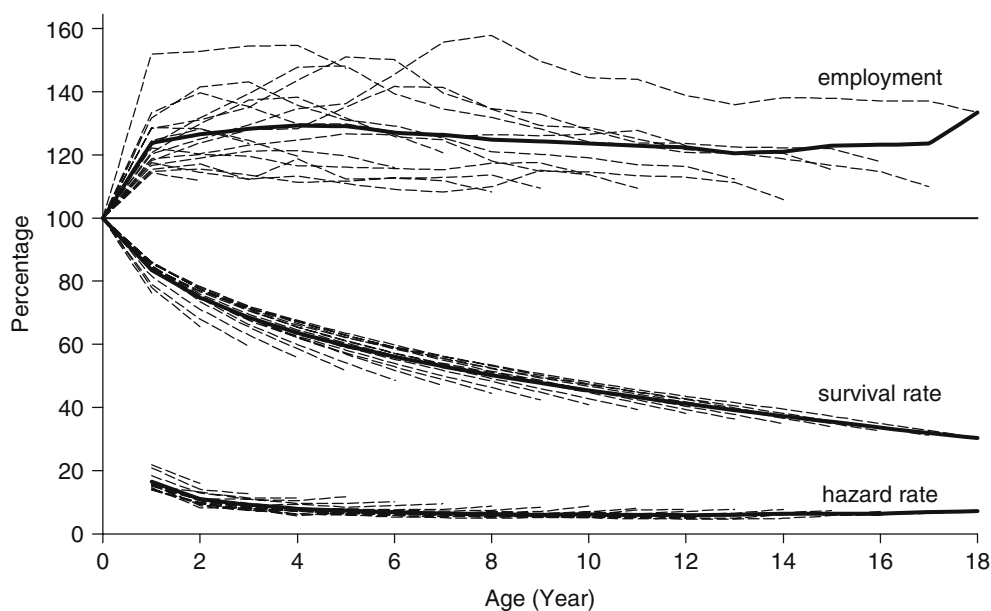


Figure 2. Evolution of employment, survival rates and hazard rates in entry cohorts – manufacturing.

and after 18 years the number of employees is slightly above 80% of the figure in the year in which the new businesses had been set up.

If we limit the analysis to the manufacturing sector, the picture of employment development over time is somewhat different (Figure 2). The

variance of employment development between the yearly cohorts is much more pronounced in manufacturing than in the service sector (Figure 3) or in the figures for all private sector industries. As in the analysis for the overall private sector, the start-up cohorts of the 1980s

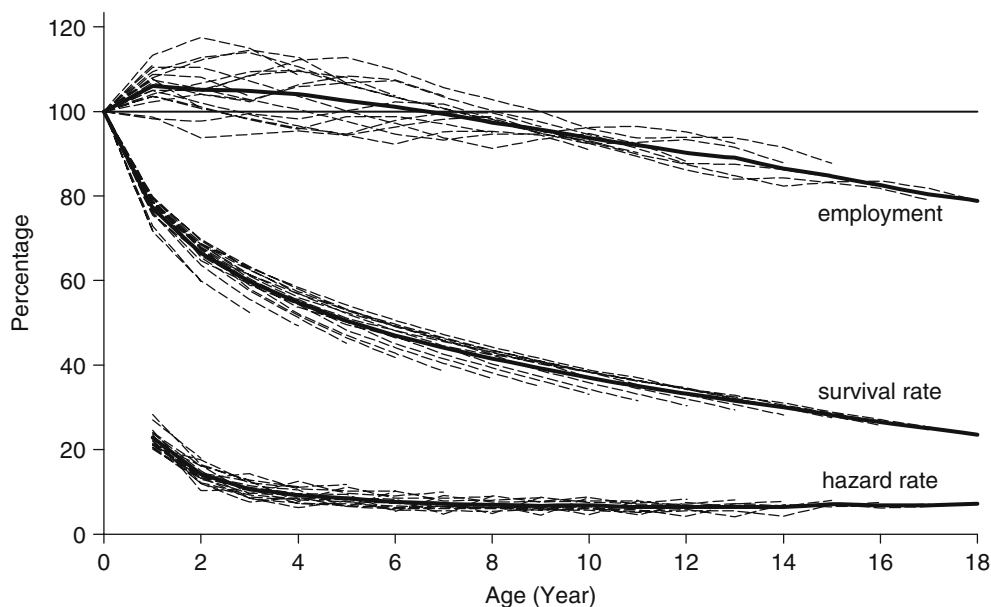


Figure 3. Evolution of employment, survival rates and hazard rates in entry cohorts – service sector.

tend to generate more employment than the cohorts of the later years. In all manufacturing start-up cohorts the number of employees remains above the initial level. The average figure reaches about 120% of initial employment in the second year and then tends to remain at that level. The slight increase of the curve for average employment that we find for the last few years should be regarded with caution because the respective figures are based on only relatively few cohorts. The average numbers for the last years are particularly affected by the development of the oldest cohort in our sample which obviously represents a special case that should not be generalized. If we exclude this cohort from the calculation of average employment, this figure declines slightly, starting about 5 years after the new businesses have been set up.

The employment development of entry cohorts in the service sector (Figure 3) is quite similar to the results that we found for the private sector as a whole (Figure 1), mainly due to the fact that most entries are in services. Average employment declines from the second year on and after about 7 years it falls below the amount of initial jobs created. After 18 years the number of employees makes about

75% of the initial level. That earlier studies of entry cohorts based on the German Social Insurance Statistics (Boeri and Cramer, 1992; Brixy and Grotz, 2004) have found only a slight decrease of cohort employment below the initial level is obviously due to the relatively short time span under investigation (at maximum 11 years). Our analysis shows that a decline of employment below the initial level starts after about 8 years, continuing until year 18, the final year that we are able to observe.

With regard to the hazard rates, the differences between the yearly cohorts (thin dotted lines; the thicker line gives the average hazard rates) are even less pronounced than what we found for survival rates (see also Tables A1–A3 in the Appendix). According to the liability of newness hypothesis we find relatively high hazard rates for the young establishments, indicating that the risk of a business closure is particularly high in the first years after its foundation. Hazard rates decline over the first years and then remain constant. Generally, hazard rates tend to be higher in the service sector than in manufacturing. These differences are particularly pronounced in the early stages of an entry cohort. While the average second year hazard rate for start-ups in services is

15.24%, the respective figure for manufacturing is 9.45%. In the fifteenth year the hazard rate in services is 5.48% and 4.81% in manufacturing. For the last observable year in our data this difference is even smaller – 5.31 in services and 5.24 in manufacturing –, but these figures are based on only one yearly cohort and can therefore not be generalized. For this same reason the slight increase of the hazard rate in manufacturing during the last years of the period of observation can hardly be regarded as significant and is therefore no confirmation of the liability of aging hypothesis.

Over the years, mortality of newly founded businesses is quite considerable. Only about 49% of the start-ups in manufacturing survive the first 10 years (see Table A2 in the Appendix) compared to about 35% in the service industries (Table A3). Of all new service establishments set up in 1984 only 23.11% survived until 2002. In manufacturing this share is about 29.93%.¹²

6. The size distribution of new businesses and the concentration of employment

Not all of the surviving businesses grow to large sizes. Figure 4 displays indicators for the size distribution within entry cohorts over their first 18 years. The 95th percentile line gives the number of employees at the lower limit of the largest 5% of the surviving start-ups. Accord-

ingly, the 90th, 75th, 50th, 25th and 10th percentiles depict the number of employees at the lower limit of the respective share of largest businesses in the sample. The 50th percentile is the median.

The fact that the median for initial employment is one means that at least 50% of the entries start with only one employee (Figure 4). As has already been reported (see Section 4 and Tables I–III), this holds for the private sector as a whole as well as for the service industries and for manufacturing. Differences between sectors can be found with regard to the larger businesses. While in manufacturing the largest 5% start with about eleven employees, the respective number in services amounts to only seven employees. Figure 4 shows the development of selected percentiles for the size distribution within start-up cohorts and of the mean of this distribution over time. Note that the curves do not represent the growth of individual firms, rather average values of subsamples of surviving start-ups.¹³ Accordingly, the composition of the subgroups changes over time due to differences in the development of the businesses, particularly, because some of them do not survive and have to exit the market. The values of the mean clearly show that on average the surviving start-ups grow over the years, but evidently not all of these businesses do so – a considerable share remains rather small. At the end of our obser-

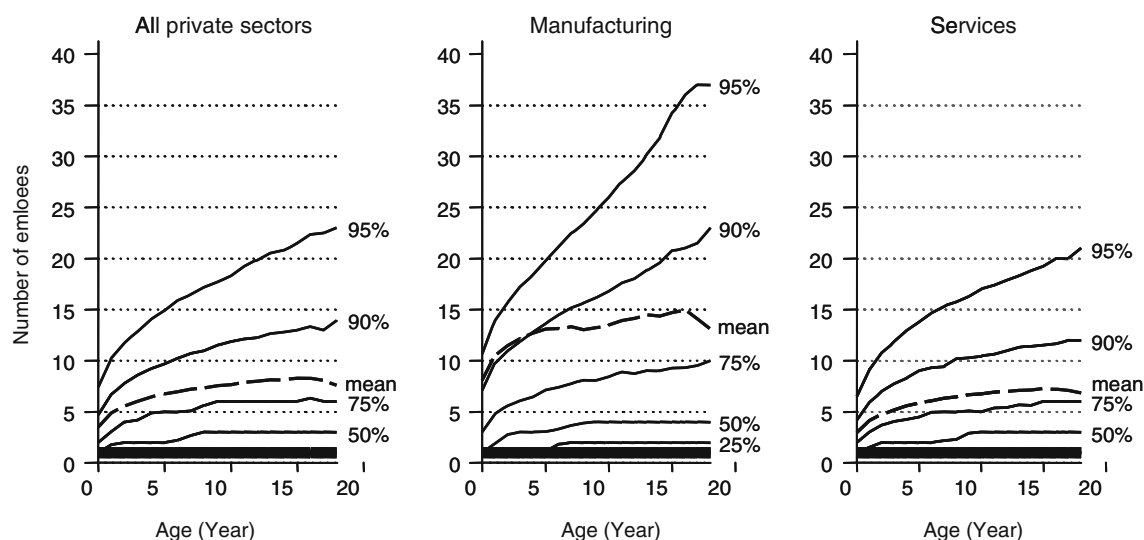


Figure 4. Development of the size distribution in entry cohorts (percentiles).

vation period at least 25% of the surviving entries in the overall private sector have only one employee. Surviving start-ups in manufacturing tend to grow larger than in services but even in manufacturing the share of start-ups with only one employee after 18 years is at least 10%. In both sectors the median size remains below five employees (four employees in manufacturing and three employees in services). Nevertheless some start-ups do show considerable growth. After 18 years, the largest 5% of the surviving start-ups in manufacturing have at least 37 employees. In services this number amounts to 22 employees. These figures are remarkably stable over the yearly cohorts. For the 10th, 25th, 50th and 75th percentiles the figures do not vary at all or only by one employee. For the 90th and 95th percentiles the variation can be more than just one employee but values of the yearly cohorts are still rather similar.

We have shown that many newly founded businesses fail (Section 5) and that only a small proportion of the surviving entities do create a considerable amount of jobs over the first 18 years of their existence. This suggests that, regarding the initial population of start-up cohorts, employment becomes more and more concentrated in only some of these businesses. In order to describe the concentration of new

jobs within the cohorts we calculated the share of employment that was in the largest 1, 5, 10 and 25% of all those units that were initially formed. The results for average concentration of employment over the 18 yearly cohorts (Figure 5) indeed show an increasing concentration over time. Taking all private sector industries together, about 38% of the jobs in the cohort after 10 years are in the largest 1% of initial start-ups. More than 65% of employment is in the largest 5% and the largest 25% of the initial start-ups comprise more than 97% of cohort employment. After 18 years the largest 1% of initial start-ups account for nearly 44% of employment and the largest 5% make up nearly three quarters of the new jobs.¹⁴ There is some variation of the concentration measures between the yearly cohorts (cf. the values of the standard deviation in Table A4 in the Appendix). However, the curves in Figure 5 describe the basic trends quite well.¹⁵ They clearly show that the direct gross employment effect of new businesses is dominated by a relatively small proportion of the newly founded entities.

For a policy aiming to stimulating employment, the concentration of new employment in relatively few start-ups may suggest to consider a “pick the winner” strategy and, thus, try to

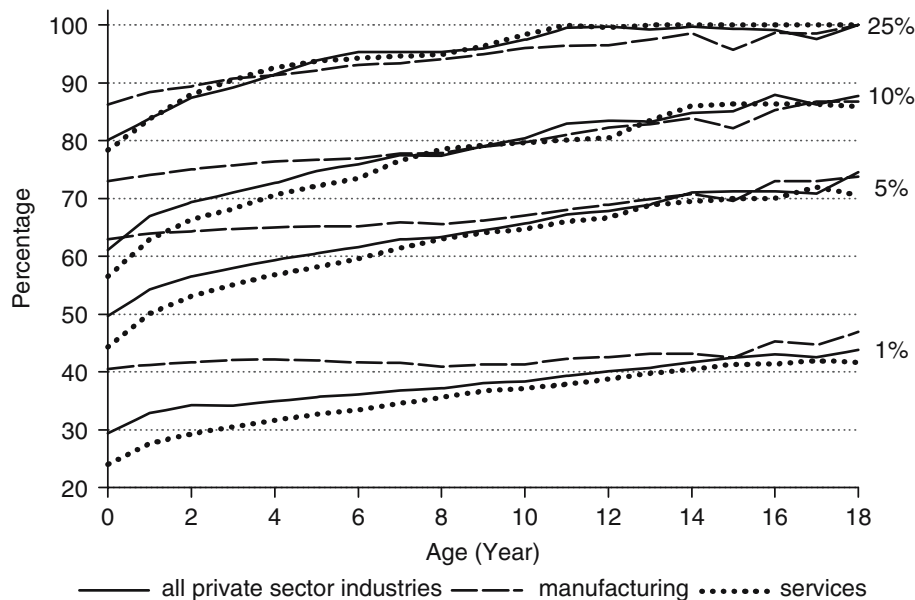


Figure 5. Employment concentration in the largest businesses by age of cohort.

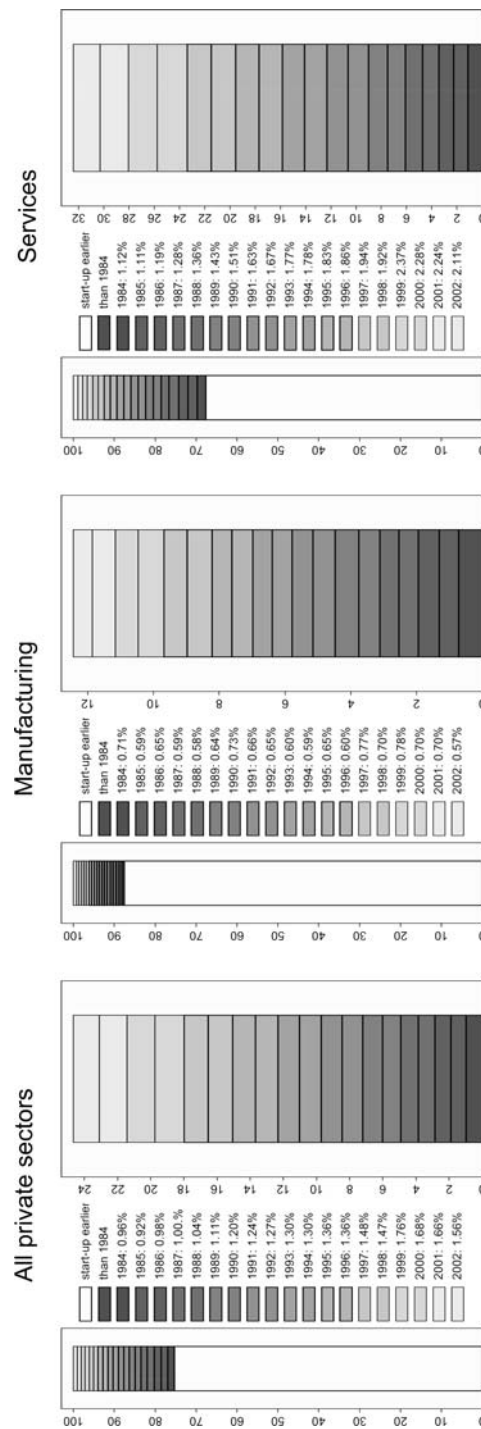


Figure 6. Share of cohort-employment in surviving firms.

target these surviving, job generating start-ups at an early stage of their development. Experience shows, however, that such an early identification of fast growing start-ups is hardly possible. Moreover, even if the fast growing new businesses could be identified, helping those start-ups that are successful even without public support may be regarded questionable since these firms have relatively good possibilities to help themselves and are, therefore, not needy. Alternatively, policy could follow a “make more winners” strategy and try to increase the number or the share of those new businesses that create a significant amount of jobs.

According to *Gibrat's Law* the growth of firms is random and independent of their size (Chesher, 1979). Testing this hypothesis with our data results in a rejection for all the cohorts and for all years. We find considerable positive serial correlation of growth rates over the years which becomes stronger as the cohorts mature. This serial correlation of growth rates indicates that growth impulses are effective over a period longer than just one year.¹⁶

7. The contribution of recent start-ups to current employment

After having analyzed the evolution of employment in entry cohorts we now investigate the contribution of the different entry cohorts to overall employment. Figure 6 shows the employment share of each of the 18 yearly entry cohorts in total employment in 2002, the final year of our analysis period. Taking all private sector industries together, the share of the businesses founded in the 18 preceding years on 2002 employment amounts to about 25%.

This share is nearly three times higher in services (32%) than in manufacturing (12%). This greater employment share of the incumbents indicates that the average age of businesses in manufacturing is substantially higher than in other industries. It may also be seen as an indication that starting a new manufacturing business is particularly difficult due to relatively high entry barriers.¹⁷

While in manufacturing the contributions of the single cohorts to 2002 employment remain roughly constant over the 18 years of analysis,

we find that in the service sector these shares are declining with age. This reflects the decrease of overall employment below the initial level that we found for the entry cohorts in services (Figure 3) and the fairly constant employment found for the entry cohorts in manufacturing. For the overall private sector we find a similar pattern as with services, however, the shares of the single cohorts to overall employment are considerably smaller. In manufacturing the contribution of an individual cohort is about 0.7%. In the service sector this share is between slightly more than 2% for the more recent cohorts and somewhat above 1% for the older vintages. For the private sector as a whole these annual rings have a thickness of between 0.92% and 1.68%.

8. Final discussion

Cohorts of newly established businesses tend to start with growing employment. But rather soon, typically after one or two years, employment in the cohort tends to be stagnant or to decline and it is quite likely that it falls considerably below the initial level after a number of years. In none of the cohorts of our sample could we find a strong and lasting increase of employment above the initial level. We cannot exclude the possibility that such a development may be identified for more narrowly defined economic sectors, regions or industries. However, the analysis clearly shows that strong employment growth of start-up cohorts is definitely not a general trend. The stagnant or declining employment in start-up cohorts is a result of two developments. First, quite a significant share of the new businesses leave the market very quickly. Approximately half of the start-ups last less than 5 years. And second, the majority of the new businesses remain rather small. Only a few of them grow and generate a significant number of jobs.

Taking all private industries together, the entries of the 18-year period 1984–2002 contributed about 25% to the employment in 2002. This share is much smaller in manufacturing (about 12%) than in the service sector (about 32%). However, this represents only the gross effect and does not account for the crowding

out of incumbents. Depending on the magnitude of such crowding-out effects, the job generating effect that can be attributed to the new businesses is considerably smaller. Over the years and decades, the cohorts may amount to a significant contribution. Yet this effect becomes relevant mainly in the long run. This is not “rapid growth”. Consequently, if the employment development in cohorts of newly founded businesses is so modest, one may question the relevance and justification of policies that try to increase the level of new firm formation in the economy. As mentioned in the introduction to this paper, market supply improvements that result from the increased competition new businesses bring may play an important role. Supply-side effects, comprising issues such as increased efficiency, acceleration of structural change, amplified innovation and greater variety, can only be measured somewhat indirectly. There are, however, indications that they are rather significant (cf. Fritsch and Mueller, 2004).

Notes

¹ For a review of the evidence see Geroski et al. (2002) and Fritsch et al. (2004).

² Agarwal and Gort (1996), Aldrich and Auster (1986), Brüderl and Schüssler (1990), Carroll and Hannan (2000), Jovanovich (2001), Ranger-Moore (1997).

³ Storey (1994, p. 119) estimates that over a period of 10 years “... approximately 4 per cent of firms create approximately half the new jobs.”

⁴ As in most studies that are based on the German Social Insurance Statistics the year is defined as the time between July 1st and June 30th of the following year (c.f. Fritsch and Brix, 2004, P. 184f.). Accordingly, in our analysis the start-ups of the year 2002 are all newly recorded businesses from July 2001 to June 2002. The last year included in Boerie and Cramers’s study is the period between July 1989 and June 1990.

⁵ A main reason for excluding new establishments with more than 20 employees is that some of the large new establishments reported in our data are probably a result of the reorganization of larger firms and do not reflect the set-up of new establishments.

⁶ The public sector is always excluded. We do not report results for the other parts of the private sector such as agriculture, fishery, mining, construction etc. separately.

⁷ There may be some misclassification in the data because the year of hiring a first employee is taken as the time of

start-up even if the establishment has already existed for a longer period of time. The share of such cases is, however, rather small (see Fritsch and Brix, 2004).

⁸ The other private sector industries that are not explicitly reported here are agriculture and forestry, fishery, energy and water supply, mining and construction. See Fritsch and Grotz (2004) for a detailed analysis.

⁹ Businesses without any employee who is subject to obligatory social insurance are not included in the German Social Insurance Statistic.

¹⁰ A regression with average initial size as explanatory variable for the overall number of employees contained in a start-up cohort has an R^2 value of 0.27.

¹¹ Since all cohorts end in the year 2002, the base year of a cohort can be identified by the length of the respective line. E.g., the nine year long line represents the start-ups of the year 1994 (= 2002-9).

¹² The hazard and survival rates in our sample correspond quite well to the numbers reported by Wagner (1994) for cohorts of new manufacturing firms in Lower Saxony, to those given by Dunne et al. (1989) for manufacturing plants in the USA and to the figures provided by Scarpetta (2003) for OECD countries. Disney et al. (2003) report considerably lower survival rates for new manufacturing establishments in the UK.

¹³ Therefore, the course of the 95th percentile line does not mean only start-ups with large initial size have a chance to grow.

¹⁴ After 18 (10) years 1.58 (2.22) percent of initial start-ups account for half of the new jobs. In manufacturing this share is 1.28 (1.88) percent and in services it makes 1.76 (2.43) percent.

¹⁵ This becomes quite clear when looking, for example, at the 95% confidence intervals for the concentration of employment after 10 years. Taking the private sector as a whole, the confidence interval for the share of the largest 1%, 5%, 10% and 25% of the start-ups ranges from 35–41, 63–68, 78–83 and 95–99 employees. For manufacturing the respective figures are 38–45, 64–70, 77–82 and 95–97 employees and for services we find 34–41, 61–68, 77–82 and 96–100 employees. The variation of the concentration measures tends to be more apparent the greater the number of cohorts with information for the respective year.

¹⁶ We applied the approach developed by Chesher (1979) and estimated with $z_{t,i}$, $z_{t-1,i}$ and $z_{t-2,i}$ being the deviation of the logarithm of a firm i ’s size (number of employees) at the time t (year) from the mean of the logarithms of the sizes of all firms at the time t . The term $u_{t,i}$ is the disturbance and β_1 , β_2 are the coefficient to be estimated. Gibrat’s Law is valid if $\beta_1 = 1$ and $\beta_2 = 0$. Detailed results are available from the authors upon request.

¹⁷ This assertion must not be a contradiction to our finding of higher survival rates for new businesses in manufacturing. One may assume that there is a self-selection process at work according to which the particular difficulties of entering a manufacturing industry induces a relatively high quality of start-ups in this sector.

Appendix

TABLE A1
Survival and hazard rates in all private sector industries

Year	Survival rate (percent) after					Hazard rate (percent) after				
	2 years	5 years	10 years	15 years	18 years	2 years	5 years	10 years	15 years	18 years
1984	61.23	47.55	35.98	27.26	23.11	16.28	8.64	5.71	4.79	5.26
1985	62.82	49.10	36.23	27.35		13.05	5.64	6.12	5.50	
1986	65.45	50.20	36.33	27.03		10.47	6.23	6.34	5.77	
1987	64.34	51.04	36.57	27.30		15.43	6.96	6.56	5.88	
1988	64.79	50.34	35.68			12.57	7.34	6.49		
1989	66.34	50.59	35.51			12.98	7.93	5.86		
1990	65.87	49.36	34.64			14.03	8.23	6.21		
1991	64.54	47.58	33.37			14.13	8.55	6.66		
1992	63.53	46.04	32.59			14.58	9.08	6.48		
1993	64.30	46.22				14.89	8.85			
1994	63.66	45.91				15.65	8.06			
1995	62.33	45.29				17.32	8.51			
1996	62.44	45.07				16.49	9.35			
1997	62.79	44.77				16.10	9.66			
1998	63.11					16.37				
1999	59.80					16.72				
2000	59.64					17.83				
Average	63.35	47.79	35.21	27.24		14.99	8.07	6.27	5.49	
Standard deviation	1.91	2.27	1.40	0.14		1.94	1.17	0.32	0.49	

TABLE A2
Survival and hazard rates in manufacturing

Year	Survival rate (percent) after					Hazard rate (percent) after				
	2 years	5 years	10 years	15 years	18 years	2 years	5 years	10 years	15 years	18 years
1984	71.90	58.08	45.05	35.40	29.93	11.48	7.36	5.31	4.27	5.31
1985	71.71	58.04	44.24	34.24		9.98	5.24	5.25	5.12	
1986	83.74	69.38	52.64	40.81		6.98	4.77	5.22	5.03	
1987	82.91	70.17	52.02	39.72		9.68	5.38	5.95	4.82	
1988	81.89	67.83	50.64			7.15	6.51	5.32		
1989	83.41	67.28	50.90			7.78	7.26	5.12		
1990	82.48	66.57	49.37			8.07	6.24	5.07		
1991	81.06	64.79	48.66			8.94	6.09	5.91		
1992	79.77	64.45	47.85			9.06	6.59	5.94		
1993	79.62	63.87				9.23	6.85			
1994	79.86	63.93				9.85	6.10			
1995	78.59	62.83				9.89	6.26			
1996	78.02	61.48				9.74	8.10			
1997	78.17	60.39				10.35	7.74			
1998	77.83					9.97				
1999	76.95					11.34				
2000	76.19					11.13				
Average	79.06	64.22	49.04	37.54		9.45	6.46	5.45	4.81	
Standard deviation	3.56	3.83	2.93	3.21		1.34	0.95	0.37	0.38	

TABLE A3
Survival and hazard rates in services

Year	Survival rate (percent) after					Hazard rate (percent) after				
	2 years	5 years	10 years	15 years	18 years	2 years	5 years	10 years	15 years	18 years
1984	60.38	47.57	36.02	27.28	23.19	17.38	9.01	5.58	4.79	5.24
1985	62.76	49.38	36.27	27.40		12.97	5.82	6.21	5.46	
1986	65.70	50.09	36.10	26.93		10.41	6.65	6.22	5.71	
1987	64.73	51.10	36.46	27.20		15.56	7.27	6.72	5.94	
1988	64.83	49.91	35.09			12.78	7.75	6.78		
1989	66.47	50.24	34.94			13.16	8.36	5.91		
1990	66.06	49.07	33.99			14.38	8.52	6.43		
1991	65.10	47.45	32.91			14.44	8.75	6.91		
1992	64.45	46.25	32.49			14.73	9.59	6.54		
1993	64.17	45.77				15.37	9.21			
1994	63.81	45.48				15.86	8.54			
1995	62.34	44.97				17.56	8.68			
1996	62.31	44.94				16.89	9.37			
1997	62.82	44.78				16.32	9.73			
1998	62.97					16.54				
1999	59.34					16.77				
2000	59.60					17.98				
Average	63.40	47.64	34.92	27.20		15.24	8.38	6.37	5.48	
Standard deviation	2.15	2.28	1.48	0.20		2.04	1.14	0.43	0.50	

TABLE A4
Employment concentration in all private sector industries (standard deviation in parentheses)

Age (Year)	Percentiles			
	1%	5%	10%	25%
0	29.39 (6.29)	49.68 (6.55)	61.08 (4.95)	80.13 (3.92)
1	32.87 (6.96)	54.26 (5.41)	66.99 (4.55)	83.79 (2.15)
2	34.23 (7.11)	56.56 (5.16)	69.40 (4.53)	87.43 (2.90)
3	34.21 (5.42)	58.00 (4.80)	71.03 (3.99)	89.18 (2.49)
4	34.91 (5.26)	59.39 (4.55)	72.69 (3.55)	91.50 (2.70)
5	35.64 (5.19)	60.52 (5.13)	74.81 (3.56)	93.88 (2.51)
6	36.16 (4.80)	61.62 (4.33)	75.95 (3.21)	95.32 (0.97)
7	36.81 (4.91)	62.94 (3.89)	77.54 (2.29)	95.38 (0.94)
8	37.16 (4.60)	63.34 (4.32)	77.41 (3.15)	95.34 (1.51)
9	38.04 (4.86)	64.51 (3.83)	79.06 (2.67)	95.98 (1.84)
10	38.41 (4.44)	65.65 (3.34)	80.39 (3.15)	97.45 (2.65)
11	39.32 (4.40)	67.23 (3.99)	82.98 (2.71)	99.51 (1.38)
12	40.09 (4.45)	67.88 (4.36)	83.47 (3.19)	99.75 (1.87)
13	40.76 (3.93)	68.96 (2.14)	83.28 (2.36)	99.23 (1.20)
14	41.65 (3.67)	71.02 (3.08)	84.85 (1.20)	99.72 (0.62)
15	42.49 (3.15)	71.25 (2.90)	85.11 (1.72)	99.39 (1.21)
16	43.03 (2.21)	71.30 (2.19)	87.93 (1.71)	99.13 (1.51)
17	42.55 (0.21)	70.91 (0.76)	86.28 (1.66)	97.61 (3.39)
18	43.83 (0.00)	74.53 (0.00)	87.70 (0.00)	100.00 (0.00)

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