

ABSTRACT. This paper reports new results on the role of firms from various size classes in the job generation process in Germany. It is based on a unique longitudinal data set covering all manufacturing establishments that existed in at least one year between 1978 and 1993 in the German federal state Lower Saxony. We find that gross job creation and destruction rates tend to decline with firm size, while net job creation rates and firm size are not systematically related when firms are classified according to their average number of employees in the base and end year. Small firms create (destroy) quite a large share of all new (lost) jobs.

1. Introduction

Ever since the publication of the seminal studies by David L. Birch (1981, 1987) on "Who creates Jobs?" the role of small firms in the job generation process has been a hotly debated topic in academics and politics in the U.S. Two recent studies by prominent experts clearly show that we have today a better understanding of the role of small firms in job creation than fifteen years before, mainly due to better data bases and more elaborate methods of analysis (cf. Davis, Haltiwanger and Schuh, 1993; Berney and Phillips, 1995). However, most of this evidence relates to the U.S., while information on other countries tends to be scarce. Given the importance of the topic under consideration for policy issues related to high and persistent unemployment in many countries, this lack of empirical evidence is regrettable.

This small empirical paper contributes to the literature in presenting results on the role of firms from various size classes in the job generation process in Germany. It is based on a unique

longitudinal data set covering all establishments that existed in at least one year between 1978 and 1993 in the manufacturing sector of Lower Saxony, a German federal state. Data and measurement issues are discussed in Section 2, results for job creation and job destruction by establishment size are presented in Section 3, and Section 4 concludes.

2. Data and measurement issues

The empirical analysis is based on data at the level of the local production unit collected regularly by the Statistical Office in surveys of the manufacturing sector. All firms are covered that are located in Lower Saxony, one of the 'old' federal states of Germany. The reason for this limited regional coverage is that in Germany due to strict data protection legislation it is in general impossible for researchers from outside the Statistical Office to have access to micro data kept therein, and it is only due to a joint project with the Lower Saxonian Statistical Office that calculations like the ones discussed below are possible. Data from two sources were matched, i.e. from the monthly report of all establishments that have a minimum of twenty employees or that are part of an enterprise with twenty or more persons employed, and from the annual report of small manufacturing establishments covering the rest of the manufacturing sector (for details and the questionnaires, see Methner, 1992). Data are for local production units, and in this paper we will use the expression *establishment* and *firm* for this type of unit, while *enterprise* refers to a legal unit that may or may not consist of more than one firm. Note that even micro manufacturing firms where the owner is the only person working in it are in this data base. A longitudinal data set was built covering all firms that existed in at least one year between

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Joachim Wagner
University of Lüneburg,
D-21332 Lüneburg,
Germany

1978 and 1993; the data base includes information on the number of persons working in each firm in each year.

Note that the number of jobs is zero for some firms in some years. If an establishment reports some employees in the year $t - 1$ but no employees in t , this can be due to various reasons: either the firm did no longer exist in t , or it interrupted production in t , or it switched (temporarily or permanently) out of the manufacturing sector (into, e.g., services), or the firm relocated to another federal state (or a foreign country). It is impossible to differentiate between the various possibilities mentioned based on the information contained in the data set alone, and checking the files in the Statistical Office is not possible due to data protection legislation and budget constraints. Therefore, each firm that reports a positive number of employees in one year and no employees in the year after has to be labeled a 'closing firm' in this study, even if this might be an incorrect label for some of them. Similarly, if an establishment reports some employees in the year t but no employees in $t - 1$, this can mean that the firm was newly founded, or that it interrupted production in $t - 1$, or that it switched into the manufacturing sector, or relocated into Lower Saxony from abroad. Here, all these establishments are labeled 'new firms', and, again, this surely is wrong for some of them.

Following an established tradition in the literature (cf., e.g., Davis, Haltiwanger and Schuh, 1993) in the study of job creation and destruction performed in this paper a job means an employment position filled by a worker – the data do not distinguish among part-time, full-time and overtime employment positions, and vacancies (i.e., unfilled positions) are not measured. Job turnover is measured as the establishment-level change in the number of filled employment positions between $t - 1$ and t . The net employment change during a two-years period for a group of firms (e.g., for firms from one of the size classes considered below) is the difference between employment in $t - 1$ and in t . This net change is the result of gross job creation (employment gains summed over all firms that either grew between $t - 1$ and t , or that are 'new' firms in t) and gross job destruction (employment losses summed over all firms that either shrunk between $t - 1$ and t , or

that 'closed' in t). Job creation and destruction figures are expressed as rates by dividing through employment in t . Therefore, the net job creation rate equals the gross job creation rate minus the gross job destruction rate.

To investigate job creation and destruction by size classes, establishments were classified as follows: (I) 1 to 19 employees; (II) 20 to 49; (III) 50 to 99; (IV) 100 to 249; (V) 250 to 499; (VI) 500 to 999; (VII) 1000 to 2499; (VIII) 2500 to 4999; (IX) 5000 and more. Evidently, this classification is in some sense arbitrary – it is applied here following Davis, Haltiwanger and Schuh (1993) to facilitate comparisons.

Davis, Haltiwanger and Schuh (1993), among others, have pointed out that a classification of firms into size classes according to their employment in the base year can bias the results of a job creation study in favour of small firms. The reason for this "regression fallacy" is that firms are reclassified into size classes each year using base-year employment, and that transitory firm-level employment movements are frequently observed. Since transitory movements reverse themselves, firms that grew between t and $t + 1$ tend to shrink between $t + 1$ and $t + 2$, and they may cross the size class boundaries. To illustrate, consider an economy with only two firms that are divided into size class 1 (small firms with 1 to 19 employees) and size class 2 (large firms with 20 and more employees). In 1991 firm 1 had 16 employees (a small firm), and it grew until 1992 by 5 employees (or 31.25 percent); firm 2 had 24 employees in 1991 (a large firm), and it shrunk to 16 employees in 1992 (growth rate: -33.33 percent). The small firm growth rate, therefore, was +31.25 percent, while the large firm growth rate was -33.33 percent. Now assume, that the employment movements were transitory and reversed themselves from 1992 to 1993: in 1992 firm 1 had 21 employees (a large firm), and it shrunk to 16 employees in 1993, having the same number of employees as in 1991; firm 2 was a small firm with 16 employees in 1992, and it grew by 8 employees to have, again, 24 employees in 1993. The small firm growth rate here is 50 percent, while the large firm growth rate is -23.81 percent. On average, the small (large) firm growth rate in the economy between 1991 and 1993 according to these calculations was 40.625 (-28.57) percent,

but each firm has the same number of employees in 1991 and 1993.

Evidently, this example exaggerates – how much, depends on the importance of transitory employment movements, and size-class boundaries. Note, however, that transitory measurement errors will by themselves introduce a potentially serious overstatement in the relative job growth performance of smaller firms using the traditional approach to firm size classification. One way to deal with the problem is to classify and reclassify firms not according to their size in the base year, but to their average size in t and $t + 1$ (or in longer periods). In our little example above firm 1 (firm 2) would have been considered to be a small (large) firm in both periods, if the average size in a period had been used to classify the firms, giving a different picture as regards the relative performance of large and small firms.

To avoid the regression fallacy, and to illustrate the importance of these movements across size class boundaries, two concepts are applied to measure firm size: establishments are either clas-

sified according to their number of employees in year t , or according to the average number of employees in year t and year $t + 1$.

Table I reports the employment shares of firms from the 9 size classes defined above for the years between 1978 and 1993. Note that employment data for firms from the two largest size classes can only be reported together, because the largest class is dominated by plants belonging to one enterprise (Volkswagen), and the data protection law prohibits publication of data when the firm or enterprise might be identified.

According to Table I the size distribution of firms in the manufacturing sector of Lower Saxony changed only slightly during the 16 years considered here, and results differed only slightly for the two measures of firm size. We had a decrease in the share of the largest firms, increases in the shares of firms from size classes 3 to 7, and small decreases of the shares of the smallest two size classes. In 1993, 41.2 percent of all firms were from size class 1 (base year employment classification), 25.7 percent from size class 2, and

TABLE I
Employment share (percentage) by two measures of establishment size, manufacturing sector, Lower Saxony, 1978–1993

	Establishments classified according to number of employees in year t								Establishments classified according to average number of employees in year t and year $t+1$							
	1 to 19	20 to 49	50 to 99	100 to 249	250 to 499	500 to 999	1000 to 2499	2500 to 4999/5000 and more ^a	1 to 19	20 to 49	50 to 99	100 to 249	250 to 499	500 to 999	1000 to 2499	2500 to 4999/5000 and more ^a
Year t																
1978	3.64	9.37	8.71	14.48	13.06	12.32	9.83	28.58	3.64	9.04	8.65	14.51	13.15	12.61	9.76	28.66
1979	3.44	9.16	9.11	14.48	13.32	12.17	10.27	28.06	3.37	8.92	9.10	14.36	13.27	12.27	9.93	28.78
1980	3.34	9.12	9.21	14.33	13.36	10.39	10.61	28.64	3.49	8.96	9.06	14.22	13.49	11.66	10.89	28.23
1981	3.52	9.39	9.11	14.13	13.46	11.71	11.18	27.49	3.62	9.33	9.06	14.06	13.47	11.77	11.08	27.61
1982	3.66	9.39	8.98	14.02	13.24	11.66	11.72	27.33	3.67	9.16	9.21	14.08	13.85	10.56	12.08	27.40
1983	3.73	9.56	9.08	14.36	14.15	10.21	11.94	26.97	3.76	9.34	8.96	14.66	13.72	10.49	12.03	27.05
1984	3.71	9.52	9.11	14.88	13.87	10.96	12.53	25.42	3.74	9.24	8.98	14.72	13.90	10.79	12.67	25.96
1985	3.72	9.14	9.00	14.58	14.13	11.45	12.36	25.61	3.71	8.90	8.89	14.63	13.56	11.81	12.75	25.75
1986	3.56	8.59	8.81	14.76	13.51	11.89	12.63	26.24	3.54	8.36	8.63	14.60	13.82	11.91	12.54	26.60
1987	3.60	8.31	8.78	15.09	13.73	11.66	13.00	25.82	3.56	8.16	8.64	15.08	13.69	11.59	13.89	25.40
1988	3.64	8.36	8.82	15.21	14.11	11.61	13.98	24.26	3.51	8.15	8.69	15.47	13.72	11.94	13.91	24.61
1989	3.45	8.44	8.97	16.04	13.38	12.00	12.49	25.23	3.33	8.20	8.84	16.07	13.23	12.51	13.82	24.01
1990	3.32	8.12	9.08	16.15	13.38	12.45	14.19	23.30	3.27	7.90	8.68	15.92	13.45	13.02	14.18	23.58
1991	3.15	7.84	9.31	16.26	13.40	13.48	13.92	22.64	3.13	7.58	9.43	16.33	13.63	13.47	13.87	22.57
1992	3.22	7.95	9.89	16.55	14.17	13.17	13.05	22.00	3.26	8.11	9.83	16.69	13.81	13.92	12.83	21.57
1993	3.45	8.28	10.17	16.95	14.35	13.35	11.93	21.51	^b	^b	^b	^b	^b	^b	^b	^b

^a Due to data protection legislation results can only be published for all firms from size classes 8 and 9 together.

^b Not available due to missing information for 1994 employment.

14.7 percent from class 3, so more than eighty percent of all establishments had less than 100 employees.

3. Job creation and destruction by establishment size

Net job creation rates, gross job creation rates, and gross job destruction rates were computed for two-year periods from 1978/1979 to 1992/1993 for all firms, and for firms from the 9 size classes defined above, using both definitions of firm size (number of employees in the base year, and average number of employees in both years). A set of 19 tables with these results plus numbers of firms and other information on job turnover is available from the author on request. Table II reports average rates over all two-years periods plus average employment shares. Results based on a classification of firm size according to base year employment are

given in the upper panel of Table II, results for the alternative measure of firm size are in the lower panel.

The upper panel shows positive average net job creation rates in the first four size classes, and negative rates in the other five; a declining trend over the size classes, however, does not show up clearly. Both average gross job creation and destruction rates tend to decline with firm size.

The net job creation pattern looks much less favorable for the small size classes if firms are classified according to their average number of employees (lower panel of Table II). In fact, firms in the smallest size class now have the highest negative net job creation rate of all classes! Evidently, transitory movements in employment and the 'regression fallacy' discussed in Section 2 operates here. While gross job creation and destruction rates tend to decline with firm size under this size measure, too, average net job

TABLE II
Average job creation and destruction rates by two measures of establishment size, manufacturing sector, Lower Saxony, 1978–1993^a

1. Establishments classified according to number of employees in year t				
Size class	Gross Job Creation	Gross Job Destruction	Net Job Creation	Employment share
1 to 19 employees	14.66	-13.98	0.67	3.51
20 to 49	9.00	-8.00	1.00	8.78
50 to 99	6.59	-6.51	0.08	9.13
100 to 249	5.52	-5.27	0.24	15.14
250 to 499	4.45	-4.79	-0.34	13.66
500 to 999	3.31	-4.57	-1.26	11.97
1000 to 2499	2.65	-4.93	-2.28	12.23
2500 to 4999	1.19	-4.75	-3.56	
5000 and more	1.67	-2.51	-0.84	25.58 ^b
2. Establishments classified according to average number of employees in year t and year t+1				
Size class	Gross Job Creation	Gross Job Destruction	Net Job Creation	Employment share
1 to 19 employees	12.12	-15.64	-3.52	3.50
20 to 49	9.32	-8.21	0.71	8.61
50 to 99	7.06	-6.66	-0.07	9.05
100 to 249	5.42	-5.40	0.02	15.16
250 to 499	4.35	-4.81	-0.46	13.60
500 to 999	3.35	-4.46	-1.15	12.15
1000 to 2499	3.52	-4.71	-1.19	12.38
2500 to 4999	1.27	-4.26	-2.99	
5000 and more	1.66	-2.53	-0.88	25.55 ^b

^a Table entries are means of values for two-year periods from 1978/79 to 1992/93. For a definition of job creation and destruction rates, see text.

^b Due to data protection legislation results can only be published for all firms from size classes 8 and 9 together.

creation rates and firm size are not systematically related.

In summary, like Davis, Haltiwanger, and Schuh (1993) for the U.S. manufacturing sector we find for manufacturing in Lower Saxony that the widely used standard practice of measuring firm size according to base-year employment leads to a regression fallacy, and, therefore, to an overly favorable impression as regards the relative job performance of small establishments.

What fraction of new manufacturing jobs did small firms create, and for what fraction of lost jobs could they be blamed? Table III reports average shares of job creation and destruction by the two measures of establishment size for the manufacturing sector of Lower Saxony between 1978 and 1993. Focussing on the lower panel of Table III because of the problems related to the base-year size measure used in the upper panel, it is evident that smaller firms did create quite a

large proportion of all new manufacturing jobs compared to their employment share, but simultaneously are to be blamed for the destruction of a large part of lost jobs, too. In the four smallest (largest) size classes both the share of jobs created and the share of jobs destroyed was larger (smaller) than the employment share of the firms in these size classes.

To put it differently, if we consider firms with less than 50 employees to be small, about 30 percent of all jobs created and about 25 percent of all jobs destroyed over the period come from this group, while the firms in it had an employment share of only about 12 percent; on the other hand, the largest firms with 1000 and more employees had a job creation share of 15.5 percent and a destruction share of 24 percent, while their employment share was some 38 percent. (These job creation/job destruction shares show a strikingly similar pattern compared with the results

TABLE III
Average shares of job creation and destruction by two measures of establishment size, manufacturing sector, Lower Saxony, 1978–1993^a

1. Establishments classified according to number of employees in year t			
Size class	Job Creation	Job Destruction	Employment share
1 to 19 employees	12.27	10.03	3.51
20 to 49	18.62	14.24	8.78
50 to 99	13.41	11.71	9.13
100 to 249	18.74	15.62	15.14
250 to 499	13.22	12.51	13.66
500 to 999	8.62	10.75	11.97
1000 to 2499	7.02	10.90	12.23
2500 to 4999/5000 and more	8.10	14.25	25.58 ^b
2. Establishments classified according to average number of employees in year t and year t+1			
Size class	Job Creation	Job Destruction	Employment share
1 to 19 employees	10.11	11.19	3.50
20 to 49	19.49	14.17	8.61
50 to 99	14.36	11.82	9.05
100 to 249	18.58	15.95	15.16
250 to 499	13.02	12.53	13.60
500 to 999	8.89	10.38	12.15
1000 to 2499	9.23	10.37	12.38
2500 to 4999/5000 and more	6.23	13.59	25.55 ^b

^a Table entries are means of values for two-year periods from 1978/79 to 1992/93. For a definition of job creation and destruction, see text.

^b Due to data protection legislation results can only be published for all firms from size classes 8 and 9 together.

reported by Davis, Haltiwanger, and Schuh (1993) in panel II of their Table 3.) In summary, not the bulk, but a quite large and, compared to employment share, over-proportionally high share of new and lost jobs are from smaller firms.

4. Concluding remarks

This paper reports new results on the role of firms from various size classes in the job generation process in Germany. We find that gross job creation and destruction rates tend to decline with firm size, while net job creation rates and firm size are not systematically related when firms are classified according to their average number of employees in the base and end year. Small firms create (destroy) quite a large share of all new (lost) jobs.

Given these findings, and that firm size and firm growth are unrelated for the establishments considered (cf. Wagner, 1992) while growing and new firms coexist with shrinking and closing firms in each and every year, industry, and size class, size alone should *not* be a cause for concern in

establishing industrial policy programs to promote firms.

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