Gross Job Flows and The Evolution of Size in U.K. Establishments

Jozef Konings[1]

ABSTRACT. This paper analyzes a relationship between establishment size and gross job creation and destruction in the U.K. during the 1980's. I find that the gross job creation rate is highest in small plants and lowest in large ones. In contrast, the gross job destruction rate is lowest in small plants and highest in large ones. In absolute numbers, however, large plants create, but also destroy most jobs. I test convergence in plant size by computing Markov transition matrices. The advantage of this approach is that it avoids Galton's fallacy of regression towards the mean and that it reflects job creation and destruction between size classes. I find no evidence of convergence, hence no regression towards the mean.

I. Introduction

Recent empirical research using establishment level employment data shows that at all phases of the business cycle and even within narrowly defined sectors there exists simultaneous creation and destruction of jobs, reflecting heterogeneous firm behaviour regarding the employment decisions (Davis and Haltiwanger, 1990, 1992 for the U.S., Boeri, 1994 for Germany, Contini and Revelli, 1991 for Italy and Konings, 1994a and Blanchflower and Burgess, 1993 for the U.K.). Gross job creation is defined as all employment gains in expanding establishments, while gross job destruction is defined as all employment losses in contracting establishments, expressed as a positive number. Dividing them through the size of the economy gives then the gross job creation and destruction rate. The difference between them yields the net employment growth rate, which is the usual working definition when employment dynamics is studied. A measure of gross job reallocation is obtained by adding gross job creation and destruction.

Most work on gross job flows has focused on the aggregate time series behaviour and properties of gross job creation and destruction. In contrast, this paper relates the process of gross job creation and destruction to establishment size in the U.K. The process of job creation and destruction is the result of forces in the product market leading to firm expansion and contraction. Factors like the intensity of price competition, technological innovation, underlying efficiency differences, etc. most likely affect the evolution of industries and establishment sizes, hence gross job turnover. The key to understand the process of gross job flows is therefore to understand the dynamic behaviour of establishment size.[2]

The structure of this paper is as follows. In section II I report gross job creation and destruction rates for different size classes, reflecting simultaneous creation and destruction of jobs *within* size classes. In section III I illustrate the traditional regression approach generating the belief that small plants grow while large ones shrink, implying convergence towards the mean. However, I show that this might be the result of Galton's fallacy. In section IV I develop an alternative econometric strategy an compute transition matrices, reflecting gross job creation and destruction *between* size classes or intra-distribution mobility. I finally report the ergodic distribution of plant sizes in the U.K.

II. Gross job creation, destruction and size

The "Small Business Economics" literature defines a small plant in an arbitrary way as for instance a plant employing less than 100 employees or less than 500 employees, often

Final version accepted on August 19, 1994

University of Leuven
LICOS
and
Centre for Economic Performance
London School of Economics

Small Business Economics 7: 213–220, 1995.

dictated by the law (Pratten, 1991). I follow a different approach, by defining five size classes *relative* to the average employment in the sample. Using a relative definition for a small plant has several advantages. Firstly, small in this case is defined relative to the average, thus as the average declines over time, also the cut-off employment level for a small plant falls. Thus a relative definition takes into account dynamic movements of the entire cross-section distribution. Secondly, depending on the sample, an arbitrary cut-off might only capture 1% of all plants. This would be the case if for instance the sample includes predominantly plants employing 500 employees are more. A cut-off of 100 employees would imply that hardly any small plant is observed. I define the five size classes in each period t as plants with less than or equal 1/4, between 1/4 and 1/2, between 1/2 and 1, between 1/2 and 2, and more than 2 times the average employment in the sample at time t. A small plant is then one located in the first size class.

I use the Workplace Industrial Relations Survey (WIRS) of 1980, 84 and 90 of plant level employment data (Millward and Stevens, 1986; Millward *et al.*, 1992). These are occasional surveys sampling more than 2000 establishments in the U.K. Large plants are over-sampled, so to compensate for this strafication the data are weighted when cross-tabulations are given. To be included in the survey the plant had to have at least 25 employees. Thus one drawback of the sample is that entry and exit is not observed. Small plants are more likely to fail, however, high exit rates are often compensated by high entry rates (Brock and Evans, 1989). I am able to compute growth rates since the survey asks retrospective questions on employment levels 12 months before the date of the survey, as well as a few years before. Table I gives an overview of the (weighted) employment cut-off levels in each size class and survey year.

In Table II I show the annual average gross job creation, destruction and reallocation rate for the five size classes. There exists a monotonic relationship between plant size and the gross job creation rate. Small plants create on average most of the new jobs in percentage terms, 20% compared to 2.1% for the largest plants. For the gross job destruction rate the relationship is reversed. The largest plants destroy on average 10% existing jobs, while the smallest destroy on average 2.6% existing ones. Of course, this could be the result of the sampling procedure: plants which had more than 25 employees 12 months before the date of the survey, but at the date of the interview employed less than 25 workers were dropped from the sample. This implies an under estimation of the true job destruction rate, at least in the bottom size class. However, this bias is unlikely to be present in the other size classes. The fact that the same relationship between the gross job destruction rate and size for all other size classes holds, suggests that the bias is not so bad after all. Furthermore, exactly the same relationship holds when an alternative dataset of large U.K. firms, instead of establishments, is used (with a small firm employing less than 1100 employees, see Konings, 1994b).

The fact that the gross job creation *rate* is highest in small plants and the gross job destruction *rate* lowest, does not necessarily imply that small plants create most jobs in absolute terms. If a small plant creates 100 extra jobs and a large plant also creates 100 extra jobs, they both create an equal number of jobs, however in percentage

TABLE I
Overview size classes (upper end) WIRS data

	1	2	3	4
WIRS80	36	72	144	288
WIRS84	28	55	110	220
WIRS90	25	50	100	198

Notes:
a) The fifth size class includes all plants employing more workers than in the fourth size class.
b) The data are weighted using the weights provided in WIRS.

TABLE II
Average gross job flows

Size category	Job creation	Job destruction	Job reallocation	Net job creation
1	0.20	0.026	0.22	0.17
2	0.075	0.045	0.12	0.029
3	0.047	0.038	0.088	0.009
4	0.039	0.048	0.088	–0.008
5	0.021	0.10	0.12	–0.084

Note: The data are weighted using the weights provided in WIRS and refer to annual averages.

terms it is the small plant which creates most jobs. I therefore computed the job creation share of small plants in total, as well as their share of job destruction in total. Table III reports the annual average results. The smallest plants account only for 4% of total job creation and 0.5% of total job destruction. Thus in absolute terms the smallest plants contribute hardly anything to job creation and destruction. This is not surprising since their employment share is also smallest. Proportionally though, they contribute much more to job creation and much less to job destruction than the larger plants as can be seen from the last two columns.

TABLE III
Share of job creation and destruction in total

Size	Job creation share (1)	Job destruction share (2)	Employment share (3)	(1)/(3)	(2)/(3)
1	0.037	0.005	0.009	5.1	0.53
2	0.064	0.031	0.038	1.9	0.88
3	0.41	0.26	0.36	1.15	0.72
4	0.39	0.37	0.41	0.94	0.89
5	0.09	0.32	0.17	0.49	1.9

Note: The data are weighted using the weights provided in WIRS and refer to annual averages.

To a certain extent the results reported here are similar to those found by Davis, Haltiwanger and Shuh (1993) in the U.S. They also report that the job creation share and the job destruction share is highest in the larger plants. This contrasts with Birch (1979) in the U.S. and Gallagher *et al.* (1990) in the U.K. reporting that most jobs are created in small plants. Davis, Haltiwanger and Shuh (1993) also find a negative monotonic relationship between the gross job creation rate and size, however, they find a negative relationship between the gross job destruction rate and size, while the results here show a positive relationship between the gross job destruction rate and size.

III. Employment growth and size: regression analysis

The process of job creation and destruction is ultimately linked to the evolution of the cross-section distribution of establishment size. The creation and destruction of jobs reflects the growth and decline of plants and hence changes in the organisation of industries. Exactly the evolution of the size distribution of businesses and hence the growth process of plants has been at the core of the literature in Industrial Organisation. The simplest version of a growth model is one in which growth rates are independent of size, which generates a log normal size distribution. This is known as Gibrat's law. Plant size distributions have been studied empirically by Hart and Prais (1956) and Simon and Bonini (1958) among others. The more recent approach in this area has been to investigate the relationship between growth rates and size in firm or plant level panel data (Evans, 1987a, b; Dunne, Roberts and Samuelson, 1989; Hall, 1987). The usual approach has been to test Gibrat's law of proportionate effects, stating that each plant in each size category has the same probability of proportional growth. The test was to estimate α_1, in equation (1).

$$[x_{it} - x_{it'}]/d = \alpha_0 + \alpha_1 x_{it'} + \varepsilon_{it}, \tag{1}$$

where $d = t - t'$, t' stands for the initial time period, x_{it} stands for log employment in plant i at time t, and ε_{it} is a white noise error term. Variations in (1) include models taking into account first order serial correlations, age effects, industry effects etc.. The general result emerging from estimating equation (1) is that initial plant size is negatively related to its growth rate, hence a rejection of Gibrat's law. To illustrate this briefly for the dataset used here I regressed for each survey year of the Workplace Industrial Relations Survey the growth rate of plant i on the log of lagged employment.[3] Table IV shows the results for 1980, 1984 and 1990. The estimated coefficient on lagged size is significant and varies between –0.021 and –0.034 depending on the sample year and the type of specification. The third specification is similar to the one reported in Evans (1987a, b) and includes an age dummy which equals 1 if the plant is more than 25 years old (20 years in the 1990 case). Thus, one would be inclined to conclude that small plants grow while large plants shrink, or plants seem to converge towards a common size. This is consistent with the facts reported in Table II, the job creation rate is highest in small plants and the job destruction rate lowest, while the reverse relationship holds for large plants.

However, this convergence interpretation or the

Table IV
Dependent variable rate plant i

1980	(1)	(2)	(3)
$\ln(\text{employment})_{it-1}$	−0.034 (0.004), [0.005]	−0.030 (0.004), [0.005]	−0.028 (0.004), [0.005]
Age	–	–	−0.013 (0.004), [0.005]
Industry and regional dummies	No	Yes	Yes
Number of observations	1886	1884	1884
1984			
$\ln(\text{employment})_{it-1}$	−0.030 (0.003), [0.008]	−0.028 (0.004), [0.009]	−0.028 (0.004), [0.009]
Age	–	–	−0.00008 (0.0045), [0.0057]
Industry and regional dummies	No	Yes	Yes
Number of observations	1814	1813	1813
1990			
$\ln(\text{employment})_{it-1}$	−0.023 (0.0039), [0.0059]	−0.023 (0.0041), [0.006]	−0.021 (0.004), [0.006]
Age	–	–	−0.0014 (0.0007), [0.0008]
Industry and regional dummies	No	Yes	Yes
Number of observations	1674	1674	1674

Note: (.) denotes OLS standard error, [.] denotes heteroscedastic consistent standard error.

negative coefficient on initial size in a growth rate regression might be misleading (just like the summary statistics in Table II). This is due to Galton's fallacy (Quah, 1993a, b; Leonard, 1986). If the dependent variable is the growth rate measured as the difference between current size and initial size and if the regressor is initial size, then firms that have a transitory low initial size, due to measurement error, will on average seem to grow faster than those with transitory high size. To illustrate this fallacy, imagine the following regression:[4]

$$x_{it} = \beta_0 + \beta_1 x_{it'} + \gamma_{it}, \tag{2}$$

where γ_{it} is a white noise error term, and

$$\beta_1 = \text{cov}_c(x_{it}, x_{it'})/\text{var}_c(x_{it'}), \tag{3}$$

where subscript c denotes cross section.

Assuming the cross-section distribution of plant size is stationary implies

$$\text{var}_c(x_{it}) = \text{var}_c(x_{it'}), \tag{4}$$

and by the Cauchy-Schwartz inequality,

$$|\text{cov}_c(x_{it}, x_{it'})| \leq [\text{var}_c(x_{it})\text{var}_c(x_{it'})]^{1/2}, \tag{5}$$

it follows that $\beta_1 \leq 1$ and hence the regression (1), setting $d = 1$, implies that

$$\alpha_1 = -[1 - \beta_1] \leq 0. \tag{6}$$

Thus even when the cross-section distribution of plant sizes is stable over time, it is still going to be the case that the coefficient on initial size in a growth rate regression as in (1) will be non-positive and hence a negative coefficient on the initial condition should not be interpreted as a collapsing cross-section distribution of plant sizes. The cross-section distribution dynamics involves changes in the shape of the distribution and intra-distribution mobility, which can only be captured imperfectly by a summary statistic, like a regression coefficient. Moreover, the regression analysis above focuses on *net employment growth*, not on *gross employment flows*. I therefore use an alternative approach which takes into account movements in the entire cross-section distribution of plant sizes and which reflects gross job creation and destruction for different size classes.

IV. Cross-section dynamics of establishment size

In this section I study the process of job creation and destruction in relation to the evolution of the cross-section distribution of plant sizes. A convenient way of summarizing gross job turnover between different size classes is to structure the data in Markov transition matrices, which describe movements of plants across states, i.e. size classes. Thus, while Table II summarizes gross job creation and destruction rates *within* size classes, here the focus is on job creation and destruction *between* size classes. Let $S_i(t)$ denote the number of plants in size class or state i at time t and let $S(t)$ stand for the vector summarizing all possible states. Then the evolution of $S(t)$ is described by a law of motion:

$$S(t+1) = M\, S(t), \tag{7}$$

where M maps one distribution into another and is called a Markov transition matrix and contains information on intra-distribution movements of plants. If there are n states then there are n^2 entries in an nXn transition matrix M indicating the probability of transition of state i to state j. Of course, there is no a priori reason why $S(t)$ should be first order or why the relationship should be time invariant, nevertheless it is a first step in analyzing the dynamics in the size distribution of establishments (Quah, 1993a). Iteration of (7) gives a predictor for future cross-section distributions or

$$S(t+s) = M^s\, S(t), \tag{8}$$

If s goes to infinity, the long-run or ergodic distribution of plant sizes may be characterized. This ergodic distribution can give an indication of convergence or divergence. Divergence might occur if $\{S(t+s)\}$ tends to a bimodal distribution, while convergence if the sequence tends towards a point mass.

To compute M, I define a discrete space of five size classes as in section II and normalize employment by average employment. This normalization controls for a declining or growing market, in other words for aggregate movements. For instance, in a declining market it is to be expected that plants become smaller over time. The entries in the M matrix are simply the relative frequencies or

$$m_{ij}(t, t+1) = n_{ij}(t)/n_i(t), \tag{9}$$

where $n_{ij}(t)$ stands for the number of plants moving from state i to state j, while $n_i(t)$ stands for the number of plants in state i at time t. The coefficient $m_{ij}(t, t+1)$ is the probability of moving from state i to state j over a one-year period and can be interpreted as unrestricted maximum likelihood estimators of transition probabilities. These transition probabilities reflect job creation and destruction *between* different size classes.

Table V gives the one-year transition matrices for 1980, 1984 and 1990, as well as the one-year average transition matrix taken over all three samples. The first column gives the total number of observations which lie in each size class and the first row shows the upper end of the grid, 1/4 the average, etc.. For instance, in the 1980 survey, 374 plants had employment less than or equal to 1/4 the average employment in the sample, of which 90.64% remained in that size class the next year, while 9% moved one size class up. Each of these transition matrices shows persistence, indicated by the high diagonal elements, with more persistence in the smallest and in the largest size class. On average, 95% of the smallest plants remained the smallest category the next year, while only 5% moved to a higher size class, indicating low job creation, i.e. migration of small plants to larger ones is limited. Most job creation and destruction between size classes occurs in the middle, in particular the third category. Only 80% of plants employing between a half the average and the average employment in the sample stayed in that size class over a one year period. The same pattern holds if transitions over a longer period are computed. Table VI shows the 6-year, 4-year and 5-year transition for the WIRS samples of 1990, 1984 and 1980 respectively.[5] Again there is higher persistence in the extremes. Most job creation from one size class to another does not occur in

TABLE V
One-year Markov transition matrices

A) 1980

	1/4	1/2	1	2	6.81
374	0.906	0.0909	0.002	0.00	0.00
506	0.025	0.926	0.047	0.00	0.00
449	0.004	0.222	0.723	0.046	0.002
263	0.000	0.003	0.068	0.897	0.030
294	0.003	0.000	0.003	0.064	0.928

B) 1984

	1/4	1/2	1	2	33/3
745	0.977	0.021	0.001	0.000	0.000
323	0.089	0.860	0.049	0.000	0.000
222	0.009	0.099	0.855	0.036	0.000
255	0.003	0.000	0.066	0.917	0.011
269	0.003	0.000	0.007	0.059	0.929

C) 1990

	1/4	1/2	1	2	22.9
509	0.974	0.025	0.000	0.000	0.000
161	0.099	0.857	0.043	0.000	0.000
129	0.007	0.093	0.845	0.046	0.007
134	0.000	0.022	0.067	0.880	0.029
184	0.000	0.005	0.005	0.054	0.934

D) Average one-year transition matrix

	1/4	1/2	1	2	21
1628	0.952	0.046	0.000	0.000	0.000
990	0.071	0.881	0.046	0.000	0.000
800	0.007	0.138	0.808	0.043	0.003
652	0.001	0.008	0.067	0.898	0.024
747	0.002	0.001	0.005	0.059	0.930
Ergodic	*0.50*	*0.31*	*0.099*	*0.056*	*0.024*

the smallest plants, but rather in the middle size categories. For instance in 1990, more than 20% of plants employing between 1/4 the average employment and 1/2 the average have moved one size class up and 12% moved one size class down. From these transition matrices it is clear that simultaneous job creation and destruction not only occurs *within* size classes, but also *between* size classes. In other words there is substantial *intra-distribution* mobility.

The bottom row in Table V panel D shows the ergodic or steady state distribution of the average one-year transition matrix. It is found by computing the eigenvector associated with an eigenvalue of 1 from this matrix. Of course, this is just an indication since I only have three points in time and in principle the ergodic distribution should be computed over a much longer time period. From the ergodic distribution it can be seen that 50% of the plants eventually end up in the smallest size class. This indicates that the long run size distribution of plants is skewed to the right. It cannot be said that there is convergence, because if there was convergence then all plants should end up at the mean, 1. This becomes clear from looking at the ergodic distributions in Table VI. There is a bimodal distribution in each sample. Many plants end up in the larger size classes, but also many end up in the smaller ones. Of course these are one-step transitions over a limited number of years and the length is different for each sample. Thus comparisons are hard to make. Moreover, most

TABLE VI

A) 1980: One step 5-year transition

	1/4	1/2	1	2	10.8
353	0.747	0.229	0.017	0.002	0.002
427	0.053	0.782	0.154	0.009	0.000
347	0.000	0.259	0.579	0.158	0.002
211	0.004	0.023	0.099	0.729	0.142
239	0.004	0.000	0.012	0.092	0.891
Ergodic	*0.069*	*0.294*	*0.165*	*0.200*	*0.27*

B) 1984: One step 4-year transition

	1/4	1/2	1	2	17.5
705	0.903	0.090	0.005	0.000	0.000
249	0.120	0.702	0.176	0.000	0.000
208	0.014	0.139	0.653	0.187	0.004
204	0.000	0.009	0.088	0.818	0.083
255	0.003	0.003	0.007	0.145	0.839
Ergodic	*0.239*	*0.161*	*0.151*	*0.28*	*0.158*

C) 1990: One step 6-year transition

	1/4	1/2	1	2	19.7
509	0.886	0.102	0.009	0.003	0.000
157	0.121	0.656	0.203	0.012	0.006
110	0.009	0.109	0.600	0.263	0.018
138	0.000	0.000	0.152	0.587	0.260
165	0.000	0.024	0.012	0.121	0.842
Ergodic	*0.13*	*0.11*	*0.15*	*0.21*	*0.37*

likely a lot of idiosyncrasies affect the probabilities since they are not averaged out. The ergodic distributions are indicative though.

To test the above results on their robustness I experimented with an alternative specification of the initial grid and extended the original five state specification to a ten state specification. Moreover, the ten states were chosen such that initially each plant had the same probability of being in a given size class, in other words each state had approximately the same number of observations initially. The results are given in Table VII. As expected, there is a lot of job turnover between the different size classes. On average, 80% of the plants initially in the smallest size class (0.16 the average) were still there the next year. The ergodic distribution shows no convergence. There are several "peaks", one at the fourth size class, one at the sixth and one at the eighth, thus confirming the result found earlier, there is no regression towards the mean.

V. Conclusion and Summary

In this paper I analyzed a relationship between gross job flows and establishment size in the U.K. in the 80's. I started with producing cross-tabulations of gross job flows for five different size classes, defined *relative* to average employment in the sample. There is a negative relationship between the gross job creation rate and plant size, but a positive one between the gross job destruction rate and plant size. In absolute numbers, however, the larger plants create most jobs, but also destroy most. Thus, the conventional wisdom that small plants are the engine of the economy seems to be debatable in the light of the current results.

The process of job creation and destruction is linked to the process of plant expansion and contraction, hence the evolution of plant sizes. This has been studied in the Industrial Organisation literature by regressing growth rates on initial size, hence testing Gibrat's law. This literature led to the believe that there is a regression towards the mean, large plants shrink on average, while small plants grow on average. However, I show that this might be a misinterpretation due to Galton's fallacy. I therefore use an alternative econometric strategy, one which takes into account movements in the entire cross-section distribution of plant sizes. I compute transition matrices, which reflect job creation and destruction *between* different size classes, and test whether there is convergence. I find no evidence of convergence, hence no regression towards the mean. Of course, this evidence should be checked by using plant level data over a longer time interval.

In this paper I did not address the question of what it is that drives the dynamic evolution of plant sizes (i.e. conditional convergence). Most likely, factors related to efficiency differences, learning effects and industry competition will matter. Investigating these underlying relationships might help to understand the process of industry evolution and hence the process of gross

TABLE VII
Average one-year Markov transition matrix 10-state specification

	0.16	0.25	0.35	0.47	0.52	0.66	0.97	1.55	2.74	33.3
471	0.80	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.0	0.00
476	0.11	0.78	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00
463	0.00	0.09	0.77	0.13	0.00	0.00	0.00	0.00	0.00	0.00
487	0.00	0.00	0.09	0.66	0.22	0.01	0.00	0.00	0.00	0.00
475	0.00	0.00	0.00	0.08	0.81	0.10	0.00	0.00	0.00	0.00
471	0.00	0.00	0.00	0.02	0.16	0.68	0.12	0.00	0.00	0.00
472	0.00	0.00	0.00	0.00	0.00	0.09	0.80	0.08	0.00	0.00
486	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.88	0.05	0.00
490	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.84	0.06
483	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.90
Ergodic	*0.049*	*0.084*	*0.093*	*0.11*	*0.022*	*0.11*	*0.10*	*0.12*	*0.06*	*0.03*

Note: The first row gives the upper end of the grid and the first column gives the number of observations in each size class.

job creation and destruction. This will rank high on the future research agenda.

Notes

[1] This paper benefitted from seminars at the London School of Economics and Trinity College, Dublin. I thank A. Lamo, R. Koopmans, A. Manning, A. Oswald, C. Pissarides, D. Quah, H. Vandenbussche and an anonymous referee for helpful comments and discussions. All errors are mine.

[2] In the Industrial Organisation's literature early contributions in this area include Hart and Prais (1956) and Simon and Bonini (1958). Recently, Evans (1987a, b) and Dunne, Roberts and Samuelson (1989) took up the issue.

[3] Whether lagged employed or employed five years lagged is used does not matter for the current discussion. I experimented with choosing earlier employment levels, but the results remained the same.

[4] This illustration is based on Quah (1993b).

[5] The choice of the transition period was imposed by the nature of the survey in each year.

References

Birch, D. L., 1979, *The Job Generating Process*, Program on Neighborhood and Regional Change, MIT, Cambridge MA.

Blanchflower, D. and S. Burgess, 1993, 'Gross Job Creation and Destruction in the U.K.', *CEP Working Paper.*

Boeri, T., 1994, 'Why Are Establishments So Heterogeneous?', *Small Business Economics* **6**, 409–420.

Brock, W. A. and D. S. Evans, 1989, 'Small Business Economics', *Small Business Economics* **1**, 7–20.

Contini, B. and R. Revelli, 1993, 'Job Creation and Labour Mobility: The Vacancy-Chain Model and Some Empirical Findings', *R&P Working Paper No. 8/R&P*, Torino.

Davis, S. J. and J. Haltiwanger, 1990, 'Gross Job Creation and Destruction: Microeconomic Evidence and Macroeconomic implications', *NBER Macro Economic Annual* **5**, 123–168.

Davis, S. J. and J. Haltiwanger, 1992, 'Gross Job Creation, Gross Job Destruction and Employment Reallocation', *Quarterly Journal of Economics* **3**, 819–863.

Davis, S. J., J. Haltiwanger and S. Shuh, forthcoming, 'Small Business and Job Creation: Dissecting the Myth and Reassessing the Facts', *Small Business Economics.*

Dunne, T., M. Roberts and L. Samuelson, 1989, 'The Growth and Failure of U.S. Manufacturing Plants', *The Quarterly Journal of Economics* **19**, 495–515.

Evans, D. S., 1987a, 'Test of Alternative Theories of Firm Growth', *Journal of Political Economy* **95**(4), 657–674.

Evans, D. S., 1987b, 'The Relationship Between Firm Growth, Size and Age: Estimates for 100 Manufacturing Industries', *Journal of Industrial Economics* **35**, 567–581.

Gallagher, C., M. Day and J. Thomason, 1990, 'The Growth of U.K. Companies 1985–87 and their Contribution to Job Generation', *The Employment Gazette*, February.

Hart, P. and S. Prais, 1956, 'The Analysis of Business Concentration: A Statistical Approach', *Journal of the Royal Statistical Society* **119**, 150–191.

Leonard, J. S., 1986, 'On the Size Distribution of Employment and Establishments', *NBER Working Paper* No. 1951.

Konings, J., 1994a, 'Gross Job Creation and Gross Job Destruction in the U.K. Manufacturing Sector', *Oxford Bulletin of Economics and Statistics*, forthcoming.

Konings, J., 1994b, *Gross Job Flows and Wage Determination in the U.K.: Evidence from Firm Level Data*, Ph.D. thesis, London School of Economics.

Millward, N. and M. Stevens, 1986, *British Workplace Industrial Relations, 1980–84*, Aldershot: Gower Press.

Millward, N., M. Stevens, D. Smart and W. R. Hawes, 1992, *Workplace Industrial Relations in Transition*, Dartmouth Publishers.

Pratten, C., 1991, *The Competitiveness of Small Firms*, Cambridge University Press.

Quah, D., 1993a, 'Empirical Cross-Section Dynamics in Economic Growth', *European Economic Review* **37**, 426–434.

Quah, D., 1993b, 'Galton's Fallacy and Tests of the Convergence Hypothesis', LSE STICERD discussion paper.

Simon, H. A. and C. P. Bonini, 1958, 'The Size Distribution of Business firms', *American Economic Review* **48**, 607–617.