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Job Creation, Job Destruction and the Role of Small Firms: Firm-Level Evidence for the UK*

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Abstract

Evidence on job creation and destruction for the United Kingdom is limited, dated, and refers almost entirely to the manufacturing sector. We use firm-level data from 1997 to 2008 for almost all sectors, including services, and show that firms in the service sector exhibit much higher rates of job creation, but almost exactly the same rates of job destruction as those in manufacturing. 'Small' firms account for a disproportionately large fraction of job creation and destruction relative to their share of employment. Jobs created by small firms are no less likely to persist than those created by large firms.

I. Introduction

Evidence on job reallocation for the United Kingdom is still limited compared with that available from other countries. Estimates are either restricted to the manufacturing

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sector, or are based on samples which exclude firm entry and exit, or are out of date. Those estimates which are available also tend to vary rather widely. Having reliable measures of job reallocation is important for several reasons. First, worker movements associated with job reallocation are more likely to be involuntary than other movements and may therefore involve considerable adjustment costs to the individuals concerned. Second, job creation and destruction decisions lie at the heart of the search framework for understanding labour market flows and unemployment. As made clear by Mortensen and Pissarides (1999), job creation and destruction are the key driving forces behind employment dynamics and the steady-state level of unemployment. Third, high rates of simultaneous job creation and destruction within narrowly defined industries are at odds with the conventional view of groups of homogeneous firms, and lends supports to more recent models of heterogeneous firms – see, for example Melitz (2003) and Bernard, Redding and Schott (2007).

A particularly important issue in the measurement of job reallocation is the contribution of 'small' and 'large' firms in the creation of new jobs. Davis, Haltiwanger and Schuh (1993; DHS) claim that, in contrast to the conventional wisdom, it is large and not small firms that account for the bulk of job creation and destruction. They argue that the conventional view that small firms contribute disproportionately to job creation is based on a statistical fallacy and an incorrect interpretation of the data. This claim has however been disputed (see, e.g. Davidsson, Lindmark and Olofsson, 1998), and this important policy issue is not clearly resolved for the UK.

This article contributes to the existing literature in three ways. First, we provide a detailed account of job reallocation in the United Kingdom for the period 1997–2008 for both the manufacturing and service sectors. We compare both the average and the distribution of job creation and destruction rates between manufacturing and services. We also examine the extent to which changes in import and export intensity have contributed to job turnover rates across industries.

Second, we examine how these patterns of job reallocation have contributed to labour productivity growth over the period. We show that the entry of new firms which are more productive than the average incumbent (and the exit of firms which are less productive) contributes more than half of the growth of labour productivity. The role of entry is significantly higher in service industries.

Third, we measure the relationship between job reallocation and firm size in the United Kingdom. We show that, regardless of measurement issues, small firms contribute a greater proportion of job creation than their employment share, and a slightly greater proportion of job destruction. We then show that the jobs created by small firms are no less persistent than those created by large firms, despite the fact that small firms are more likely to exit.

The article is organized as follows. In section II we describe the data used in the article; In section III we describe the methodology used to measure job turnover; section IV then describes the pattern of job reallocation in the United Kingdom from 1997 to 2008, and compares the results with previous findings; section V examines

the role that job turnover plays in productivity growth; section VI examines how job turnover varies by firm size; finally, section VII concludes.

II. Data

The data we use to calculate job reallocation rates come from the *Inter-Departmental Business Register* (IDBR). The IDBR is a live register of all businesses in the United Kingdom, held by the Office for National Statistics (ONS) since 1994. This register is based on inputs from two main sources: Customs and Excise (VAT-registered businesses) and the Inland Revenue (PAYE-registered businesses). Enterprises which are not registered for VAT, and which do not operate the PAYE scheme are not included in the register. However, the ONS (2001) believes that the IDBR covers about 99% of business activity in the United Kingdom, and it is used by them as the key sampling frame for UK Business Statistics. Because the IDBR is a live register, we use annual 'snapshots' which form the new *Business Structure Database* (BSD), which contains data for each year from 1997 onwards.

The unit of analysis on which we focus is an *enterprise*. An enterprise is defined as the 'smallest combination of legal units that is an organisational unit producing goods and services, which benefits from a certain degree of autonomy …' (ONS, 2001). Within the BSD, each enterprise is allocated a unique reference number, and the BSD is designed to ensure that enterprise reference numbers consistently identify enterprises over time. We exclude enterprises which are coded as inactive. This allows us to track enterprise entry, exit and employment over time.

The resulting dataset comprises between 1.7 and 2.0 million annual observations on enterprises from 1997 to 2008. Table 1 reports the number of enterprises in each year, their total and average employment, plus information on entry and exit. The firms in our sample report employment of 18.6 million in 2008. This is approximately 95% of the private sector workforce in the United Kingdom.[1]

III. Methodology

In this article, we follow the basic methodology introduced by DHS to measure job turnover. Employment growth in enterprise i between $t-1$ and t is given by:

$$g_{it} = \frac{(N_{it} - N_{it-1})}{1/2(N_{it} + N_{it-1})}. \tag{1}$$

Dividing by average employment ensures that g is constrained between -2 and 2 in the presence of entry and exit. To aggregate employment growth across enterprises we define a weight:

[1]ONS time series G7K5 reports total private sector employment of 23.7 million; series DYZN reports total self-employment of 4.2 million in 2008Q2. The remaining private sector jobs are in education and health services, which we have excluded.

TABLE 1

BSD sample, 1997–2008

	Enterprises	*Entrants*	*Exiters*	*Total employment*	*Average employment*
(a) Manufacturing (Standard Industrial Classification (SIC) Section D)					
1997	185,567			4,444,834	23.95
1998	188,902	22,874	19,539	4,320,079	22.87
1999	186,152	16,990	19,740	4,264,347	22.91
2000	178,247	16,974	24,879	4,143,218	23.24
2001	177,630	16,181	16,798	3,997,969	22.51
2002	175,375	16,099	18,354	3,934,150	22.43
2003	171,217	15,051	19,209	3,692,601	21.57
2004	167,946	16,459	19,730	3,516,534	20.94
2005	163,914	14,542	18,574	3,315,712	20.23
2006	160,032	12,973	16,855	3,180,004	19.87
2007	158,284	13,895	15,643	3,041,959	19.22
2008	154,084	14,082	18,282	2,953,862	19.17
(b) Services (SIC Sections G–K)					
1997	1,139,459			11,036,804	9.69
1998	1,195,321	196,020	140,158	11,111,626	9.30
1999	1,224,654	165,643	136,310	11,231,436	9.17
2000	1,230,074	173,658	168,238	11,581,057	9.41
2001	1,253,761	171,357	147,670	11,966,241	9.54
2002	1,267,013	174,777	161,525	12,419,301	9.80
2003	1,279,395	180,543	168,161	12,660,676	9.90
2004	1,327,284	224,379	176,490	12,747,453	9.60
2005	1,371,003	216,525	172,806	13,104,207	9.56
2006	1,409,421	211,946	173,528	13,390,961	9.50
2007	1,460,526	224,322	173,217	13,614,369	9.32
2008	1,462,091	232,419	230,854	13,833,435	9.46
(c) Total (SIC Sections A–K)					
1997	1,711,718			16,872,582	9.86
1998	1,787,292	267,768	192,194	16,842,634	9.42
1999	1,817,703	216,962	186,551	16,922,261	9.31
2000	1,809,892	225,887	233,698	17,176,037	9.49
2001	1,834,889	220,477	195,480	17,469,777	9.52
2002	1,846,481	223,085	211,493	17,932,048	9.71
2003	1,853,472	229,407	222,416	17,965,285	9.69
2004	1,902,980	280,680	231,172	17,846,326	9.38
2005	1,945,392	270,240	227,828	18,035,330	9.27
2006	1,983,813	262,274	223,853	18,218,407	9.18
2007	2,044,528	280,781	220,066	18,324,850	8.96
2008	2,039,030	292,357	297,855	18,577,774	9.11

$$w_{it} = \frac{(N_{it} + N_{it-1})}{\sum_{i \in \mathcal{E}_{jt}} (N_{it} + N_{it-1})}, \tag{2}$$

where $\mathcal{E}_{jt}$ is the set of enterprises in group j at time t or $t-1$.[2] In the analysis, a 'group' j could be a sector, region, firm size category and so on. The rate of job creation, JC_{jt}, within any group can then be calculated by taking the sum of employment-weighted employment growth for positive values of g_{it}:

$$\mathrm{JC}_{jt} = \sum_{i \in \mathcal{E}_{jt}, g > 0} w_{it} g_{it}. \tag{3}$$

Conversely, the rate of job destruction JD_{jt} in group j is given by the sum of the employment-weighted growth in employment for negative values of g_{it}:

$$\mathrm{JD}_{jt} = \sum_{i \in \mathcal{E}_{jt}, g < 0} w_{it} |g_{it}|. \tag{4}$$

JC_{jt} can be further broken down into that which arises because firms grow and that because of firm entry. Likewise, JD_{jt} can be broken down into that due to continuing firms reducing employment and that due to firm exit.

Note that, in common with the rest of the literature, this measure based on enterprise employment ignores two potentially important parts of job reallocation. The first is job reallocation which occurs *within* enterprises because we do not measure all inflows and outflows into each firm, only their total employment.[3] Even within firms, gross flows are unlikely to equal net employment change. For example, firms may change the composition of their workforce, or they may reallocate jobs across separate production units. The second is job reallocation which occurs between $t-1$ and t but which is not captured by changes in N_{it}. For example, a firm which creates a job and destroys a job between $t-1$ and t is recorded as having zero job reallocation. For both these reasons, our measures are underestimates of total job reallocation.

The gross job reallocation rate JR_{jt} is defined as $\mathrm{JC}_{jt} + \mathrm{JD}_{jt}$. Gross job reallocation can be thought of as the 'maximum' number of worker movements needed to adjust to changes in employment opportunities across enterprises. It is the maximum in the sense that it counts workers both when they lose their jobs as a result of job destruction and also when they move to a job which is created. In contrast, the minimum amount of worker reallocation for a given rate of job reallocation is given by the net reallocation rate (or the net employment growth rate):

$$\mathrm{NR}_{jt} = \mathrm{JC}_{jt} - \mathrm{JD}_{jt}, \tag{5}$$

whereas the rate of excess reallocation in group j is the difference between the gross and net rates of job reallocation:

[2] $\mathcal{E}_{jt}$ therefore includes enterprises which disappear and enter between $t-1$ and t.

[3] The use of linked employer–employee data offers the possibility of measuring these within-enterprise flows. See Abowd, Corbel and Kramarz (1999) for example.

$$XR_{jt} = JR_{jt} - NR_{jt}. \quad (6)$$

XR_{jt} is therefore a measure of the number of job changes in excess of those required to accommodate employment growth.

IV. Job reallocation in the UK, 1997–2008

Table 2 reports the aggregate job creation and destruction rates for manufacturing, services and the economy as a whole. In manufacturing, the job creation rate averages 10% per year, whereas job destruction is −13.7%. These relative magnitudes reflect the continuing decline in manufacturing employment over this period. Job creation rates are higher in services, at 15.6%, but destruction rates are not noticeably lower (−13.6%), illustrating that a sector which is growing does not necessarily have low rates of job destruction. In overall terms these rates amount to approximately 50,000 jobs being created and 47,000 being destroyed *each week*, with the service sector accounting for over 70% of this turnover.

The fourth column of Table 2 (net reallocation rates) confirms that manufacturing was shrinking whereas the service sector was expanding every year. The difference in the growth rates of the two sectors is largely due to differences in the job creation rate rather than job destruction.

In Table 3 we break down total job creation rates into that caused by enterprise growth and enterprise entry, and job destruction rates into that caused by decline and exit. The entry of new firms accounts for 30% of job creation, whereas the exit of firms accounts for 45% of job destruction, with a slightly higher proportion of job reallocation in services owing to enterprise entry and exit.

To put this in perspective, Figure 1 compares these results with previous estimates that have been obtained for the United Kindom. The closest comparison with our figures is provided by Barnes and Haskel (2002) who examine UK manufacturing plants from 1981 to 1990. However, their estimates are based on 'establishments',[4] and we would therefore expect their estimates to be higher because they will also capture some job reallocation within enterprises if enterprises have multiple establishments. The fact that their estimates are *not* noticeably higher suggests either that: (i) job turnover has increased since the early 1990s; (ii) within-firm job reallocation is relatively unimportant; or (iii) 'establishments' in their study correspond closely to our notion of enterprises.

As the IDBR also contains information at the local unit (plant) level, we repeated our calculations at this lower level of aggregation. We find that job creation rates are about 7 percentage points higher and job destruction rates about 6 percentage points higher when measured at the local unit level. This implies that about one-third of job creation and destruction is accounted for by local units. However, in the analysis that

[4]The lowest unit within the business able to complete a survey form.

TABLE 2

Job creation and destruction rates, 1998–2008

	JC_t	$-JD_t$	JR_t	NR_t	XR_t
(a) Manufacturing (Section D)					
1998	0.113	−0.142	0.255	−0.028	0.226
1999	0.099	−0.112	0.211	−0.013	0.198
2000	0.099	−0.128	0.228	−0.029	0.199
2001	0.116	−0.151	0.267	−0.036	0.231
2002	0.130	−0.146	0.277	−0.016	0.261
2003	0.097	−0.160	0.257	−0.063	0.193
2004	0.085	−0.134	0.219	−0.049	0.170
2005	0.085	−0.143	0.228	−0.059	0.169
2006	0.080	−0.121	0.201	−0.042	0.159
2007	0.084	−0.128	0.213	−0.044	0.168
2008	0.080	−0.109	0.188	−0.029	0.159
Average	0.100	−0.137	0.238	−0.037	0.201
(b) Services (Sections G–K)					
1998	0.192	−0.185	0.377	0.007	0.370
1999	0.143	−0.133	0.276	0.011	0.266
2000	0.164	−0.134	0.298	0.031	0.268
2001	0.164	−0.132	0.296	0.033	0.263
2002	0.193	−0.156	0.349	0.037	0.312
2003	0.160	−0.141	0.302	0.019	0.282
2004	0.141	−0.135	0.276	0.007	0.269
2005	0.162	−0.135	0.297	0.028	0.270
2006	0.142	−0.121	0.263	0.022	0.242
2007	0.143	−0.126	0.269	0.017	0.252
2008	0.134	−0.118	0.252	0.016	0.236
Average	0.156	−0.136	0.291	0.020	0.271
(c) Total (Sections A–K)					
1998	0.172	−0.174	0.346	−0.002	0.344
1999	0.133	−0.128	0.261	0.005	0.257
2000	0.149	−0.134	0.283	0.015	0.269
2001	0.156	−0.139	0.294	0.017	0.277
2002	0.182	−0.156	0.338	0.026	0.312
2003	0.148	−0.146	0.294	0.002	0.292
2004	0.130	−0.137	0.267	−0.007	0.261
2005	0.148	−0.137	0.285	0.011	0.275
2006	0.131	−0.121	0.252	0.010	0.242
2007	0.132	−0.127	0.259	0.006	0.253
2008	0.132	−0.118	0.249	0.014	0.236
Average	0.146	−0.137	0.283	0.009	0.274

follows we continue to focus on job reallocation at the enterprise level, as the IDBR is designed to maintain the integrity of the enterprise rather than the local unit.[5]

[5]Changes in employment and firm structure may therefore be less accurately recorded at the local unit level (ONS, 2001).

TABLE 3

Job reallocation: component parts

	JC_t			$-JD_t$		
	Total	*Growth*	*Entrants*	*Total*	*Decline*	*Exit*
(a) Manufacturing (Section D)						
1998	0.113	0.078	0.035	−0.142	−0.091	−0.050
1999	0.099	0.070	0.029	−0.112	−0.063	−0.049
2000	0.099	0.066	0.034	−0.128	−0.069	−0.059
2001	0.116	0.071	0.045	−0.151	−0.093	−0.058
2002	0.130	0.097	0.033	−0.146	−0.095	−0.052
2003	0.097	0.067	0.030	−0.160	−0.093	−0.067
2004	0.085	0.058	0.027	−0.134	−0.070	−0.064
2005	0.085	0.061	0.024	−0.143	−0.078	−0.066
2006	0.080	0.059	0.021	−0.121	−0.068	−0.053
2007	0.084	0.061	0.023	−0.128	−0.073	−0.055
2008	0.080	0.057	0.022	−0.109	−0.064	−0.045
Average	0.100	0.070	0.030	−0.137	−0.080	−0.057
(b) Services (Sections G–K)						
1998	0.192	0.127	0.064	−0.185	−0.110	−0.075
1999	0.143	0.097	0.047	−0.133	−0.056	−0.076
2000	0.164	0.116	0.049	−0.134	−0.067	−0.067
2001	0.164	0.112	0.053	−0.132	−0.075	−0.057
2002	0.193	0.142	0.051	−0.156	−0.093	−0.063
2003	0.160	0.117	0.044	−0.141	−0.075	−0.066
2004	0.141	0.091	0.051	−0.135	−0.066	−0.069
2005	0.162	0.115	0.048	−0.135	−0.065	−0.070
2006	0.142	0.101	0.042	−0.121	−0.067	−0.054
2007	0.143	0.101	0.041	−0.126	−0.070	−0.056
2008	0.134	0.087	0.046	−0.118	−0.060	−0.058
Average	0.156	0.108	0.048	−0.136	−0.072	−0.064
(c) Total (Sections A–K)						
1998	0.172	0.115	0.058	−0.174	−0.105	−0.069
1999	0.133	0.091	0.042	−0.128	−0.060	−0.069
2000	0.149	0.105	0.045	−0.134	−0.068	−0.066
2001	0.156	0.104	0.052	−0.139	−0.082	−0.057
2002	0.182	0.135	0.047	−0.156	−0.095	−0.061
2003	0.148	0.106	0.042	−0.146	−0.081	−0.065
2004	0.130	0.084	0.046	−0.137	−0.068	−0.069
2005	0.148	0.105	0.043	−0.137	−0.067	−0.070
2006	0.131	0.093	0.038	−0.121	−0.067	−0.054
2007	0.132	0.095	0.038	−0.127	−0.072	−0.055
2008	0.132	0.089	0.042	−0.118	−0.061	−0.057
Average	0.146	0.101	0.044	−0.137	−0.075	−0.062

Blanchflower and Burgess (1996) calculate job creation and destruction over approximately the same time period as Barnes and Haskel (2002). However, they use a relatively small sample of establishments derived from the Workplace Industrial

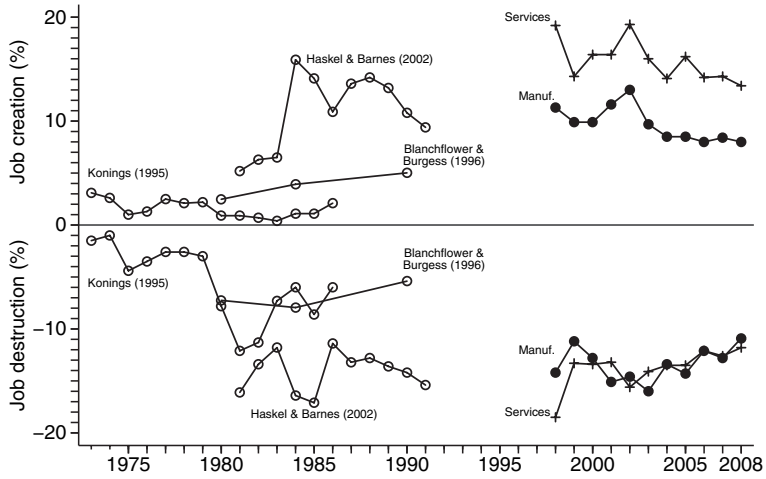

Figure 1. Comparison of UK estimates of job reallocation rates
Notes: All estimates are based on manufacturing except where stated. Konings (1995) and Blanchflower and Burgess (1996) estimates exclude plant entry and exit.

Relations Surveys and, although they include both manufacturing and services, they are unable to calculate job reallocation as a result of establishment entry and exit. This explains why their estimates are much lower than those we calculate. Konings (1995) uses an even smaller sample of manufacturing firms drawn from EXSTAT/DATASTREAM covering the period 1972–86. Again he cannot include entry and exit and, as a consequence, computes relatively low rates of job creation and job destruction.

A final series of papers (Gallagher, Daly and Thomason, 1990; Daly *et al.*, 1991; Gallagher and Robson, 1995) compute job reallocation rates for various periods in the 1980s. However these use the commercial Dun and Bradstreet database which, as the Organization for Economic Cooperation and Development or OECD (1994) notes, has several important drawbacks for the purpose of calculating job reallocation rates.[6] We do not therefore present these estimates in Figure 1.

Recent work by Haltiwanger, Scarpetta and Schweiger (2008) provides a useful set of comparisons across a number of countries. Our data are a significant improvement on the UK data used in Haltiwanger *et al.* (2008, table B.1), as ours cover both manufacturing and services. Our results suggests that job flows in the United Kingdom are slightly higher than the OECD average although easily within 1 standard deviation of the average.

In the United States, some studies have documented a secular decline in job turnover rates. For example, Davis *et al.* (2007, figure 4) show a marked decline in job creation and destruction rates over the period 1990–2005. They also estimate that the fall in the job destruction rate can explain almost half of the drop in the unemployment

[6] *Inter alia*, they argue that 'data for openings and closures are particularly weak … Employment data are missing for about 12 per cent of establishments, while employment totals are missing for about 13 per cent of firms … The coverage of small service sector firms is incomplete' (p. 108).

inflow rate over the same period. One striking feature of Figure 1 is the decline in total job turnover during the sample period, and particularly since 2002. It appears that both job creation and job destruction were falling over this period. Our data do not yet show any indications of increased job destruction in 2008, presumably because the BSD is a snapshot of the IDBR taken in March of each year.

The distribution of employment growth

We have seen in Tables 2 and 3 that firms in the service sector have similar rates of job destruction and slightly higher rates of job creation than those in manufacturing. These average differences might however disguise differences in the *distribution* of employment growth across sectors. To investigate this, Figure 2 plots the cumulative distribution of employment growth g_{it} (unweighted and weighted) separately for manufacturing and services.

Both figures tell a similar story. The distribution of job destruction rates ($g < 0$) is almost identical across manufacturing and services, with the fraction of g accounted for by firm exit ($g = -2$) also being similar. A slightly higher proportion of manufacturing firms has zero growth ($g = 0$), and this difference causes the fraction of growing firms to be larger in services for all positive values of g. Weighting by employment reduces the proportion of firms with $g = 0$, indicating that large firms are less likely to have static employment.

Job reallocation by industry

Table 4 documents average job reallocation rates broken down by two-digit SIC 1992 industry. To help interpret these results, Figure 3 plots job creation and destruction rates against each other, with the largest 30 industries being labelled with their SIC code (see Table 4). The size of each dot reflects the employment level in each industry. Industries lying in the northeast corner are those which exhibit 'high turnover' (with both high levels of job creation and high levels of job destruction), whereas those in the northwest corner are 'high growth' (with higher levels of job creation than destruction).

The importance of service sector employment relative to manufacturing employment can be seen clearly in Figure 3. Almost all of the industries in the service sector are growing, and almost all manufacturing industries are shrinking. Important fast-growing industries include computer and related (72), real estate (70), other business activities (74), hotels and restaurants (55), retail trade (52) and construction (45).

Second, it is striking that there is a strong *positive* correlation between job creation and destruction, and this correlation is much stronger in the expanding service sector.[7] Because of this, the correlation between net reallocation (or employment growth) and

[7] $\rho = 0.8713$, p-value 0.000 for services, $\rho = 0.2185$, p-value 0.000 in manufacturing (correlations weighted by employment).

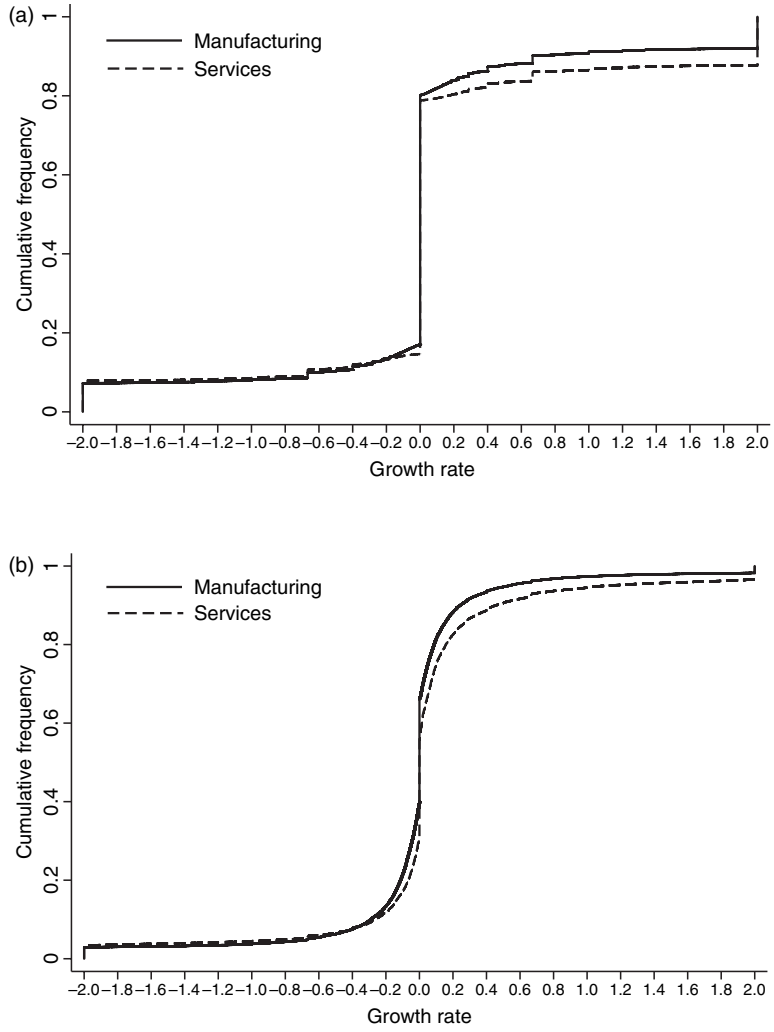

Figure 2. Cumulative distribution of employment growth, 1997–2008 – (a) unweighted; (b) weighted.

job creation or destruction is very weak, with some of the fastest growing industries having high rates of job destruction. Note that two service sector industries which have not expanded over this period are in the financial sector: financial intermediation (65) and insurance (66). Table 4 demonstrates that all financial service sectors experienced a large net exit of enterprises.[8]

Third, gross job reallocation shows much less variability in manufacturing, with most manufacturing industries being tightly clustered in Figure 3. The figure also

[8]SIC 65, for example, lost 304,000 jobs due to enterprise exit over the period 1998–2008 but gained only 104,000 jobs due to enterprise entry.

TABLE 4

Job creation and destruction rates by industry

	SIC 92 section and division	*JC*	*−JD*	*JR*	*NR*	*XR*
A						
1	Agriculture	0.161	−0.175	0.336	−0.014	0.322
2	Forestry	0.177	−0.167	0.344	0.010	0.334
B						
5	Fishing	0.174	−0.177	0.351	−0.003	0.349
C						
10	Mining of coal	0.091	−0.169	0.260	−0.077	0.183
11	Extraction of crude oil and natural gas	0.151	−0.173	0.325	−0.022	0.303
13	Mining of metal ore	0.171	−0.519	0.690	−0.348	0.342
14	Other mining and quarrying	0.120	−0.139	0.259	−0.019	0.240
D						
15	Food and beverages	0.104	−0.128	0.232	−0.024	0.208
16	Tobacco	0.134	−0.178	0.312	−0.044	0.268
17	Textiles	0.086	−0.174	0.260	−0.088	0.173
18	Wearing apparel	0.111	−0.244	0.355	−0.133	0.222
19	Leather	0.090	−0.204	0.293	−0.114	0.179
20	Wood	0.107	−0.129	0.236	−0.022	0.213
21	Pulp and paper	0.092	−0.137	0.230	−0.045	0.185
22	Publishing and printing	0.119	−0.134	0.253	−0.015	0.238
23	Coke and petroleum	0.080	−0.076	0.157	0.004	0.152
24	Chemicals	0.095	−0.144	0.239	−0.050	0.189
25	Rubber and plastic	0.092	−0.126	0.217	−0.034	0.183
26	Non-metallic mineral products	0.091	−0.126	0.217	−0.034	0.183
27	Basic metal products	0.070	−0.129	0.199	−0.059	0.141
28	Fabricated metal products	0.102	−0.125	0.227	−0.023	0.204
29	Machinery and equipments	0.086	−0.131	0.217	−0.045	0.171
30	Office machinery and computers	0.134	−0.151	0.285	−0.017	0.268
31	Other electrical machinery	0.096	−0.150	0.246	−0.053	0.193
32	Radio and television equipments	0.098	−0.177	0.275	−0.080	0.195
33	Medical and optical equipments	0.099	−0.132	0.231	−0.033	0.198
34	Motor vehicles	0.086	−0.120	0.206	−0.034	0.172
35	Other transport equipments	0.100	−0.109	0.209	−0.009	0.200
36	Furniture and other manufactures	0.134	−0.152	0.285	−0.018	0.268
37	Recycling	0.189	−0.154	0.343	0.035	0.307
E						
40	Electricity and gas distribution	0.119	−0.134	0.253	−0.015	0.238
41	Water distribution	0.083	−0.109	0.192	−0.027	0.165
F						
45	Construction	0.187	−0.145	0.332	0.042	0.289
G						
50	Retail automotive trades	0.135	−0.138	0.273	−0.003	0.269
51	Wholesale trade	0.128	−0.124	0.252	0.003	0.249
52	Retail trade	0.109	−0.091	0.201	0.018	0.183

TABLE 4

(continued)

	SIC 92 section and division	*JC*	*−JD*	*JR*	*NR*	*XR*
H						
55	Hotels and restaurants	0.177	−0.166	0.343	0.012	0.331
I						
60	Land transport	0.124	−0.107	0.230	0.017	0.213
61	Water transport	0.177	−0.228	0.404	−0.051	0.354
62	Air transport	0.089	−0.078	0.168	0.011	0.156
63	Auxiliary transport activities	0.134	−0.115	0.249	0.019	0.230
64	Post and telecommunications	0.089	−0.084	0.173	0.005	0.169
J						
65	Financial intermediation	0.122	−0.144	0.267	−0.022	0.244
66	Insurance and pension funding	0.141	−0.175	0.316	−0.034	0.282
67	Auxiliary finance activities	0.229	−0.227	0.456	0.003	0.454
K						
70	Real estate	0.222	−0.171	0.393	0.051	0.342
71	Renting of machinery and equipments	0.154	−0.149	0.303	0.005	0.298
72	Computer and related	0.221	−0.186	0.407	0.035	0.372
73	Research and development	0.113	−0.089	0.202	0.023	0.179
74	Other business activities	0.202	−0.154	0.356	0.048	0.308
	All industries	0.146	−0.137	0.283	0.009	0.274

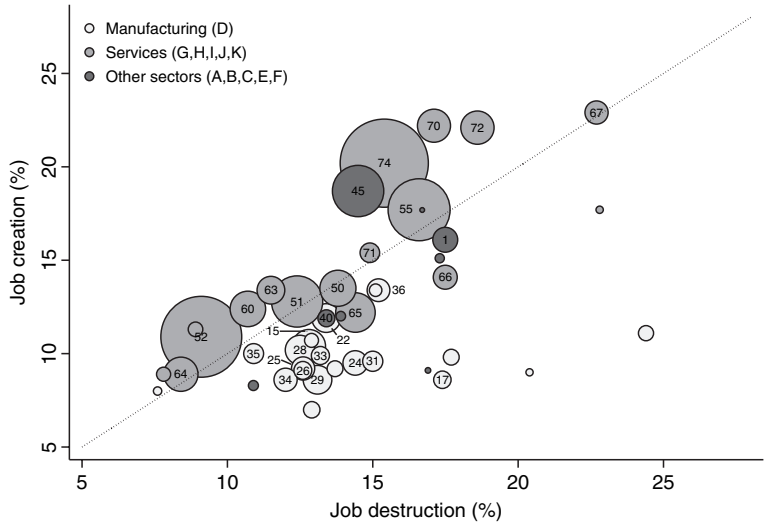

Figure 3. Job reallocation rates by industry. Largest 30 industries labelled with SIC code: see Table 5

emphasizes that employment decline in manufacturing is driven mainly by differences in job destruction rates rather than job creation. The most significant industries in manufacturing in terms of employment are chemicals (24), machinery (29), metal

products (28), rubber and plastics (25) and food (15), all of which have experienced significant employment falls.

Exposure to international competition

We have shown that job reallocation rates vary widely across sectors. In particular, Figure 3 shows that the relative decline of the manufacturing sector can largely be attributed to differences in job destruction rates. But, thus far, we have said nothing about the possible causes of these different rates of reallocation. One strand of the literature has asked whether exposure to foreign trade might account for these patterns: see, for example, DHS (1996a), Levinsohn (1999) and Klein, Schuh and Triest (2003). In this section, we follow this line of reasoning by comparing job turnover rates across industries according to their exposure to international competition.

For each four-digit industry we compute the import penetration ratio and export share.[9] We classify each industry according to the *change* in the import or export intensity between the average for the first three years (1997–99) and the average for the last three years (2006–08). We use averages in this way to reduce the possibility of measurement error in the trade shares in any single year.[10] We then allocate industries into quintiles according to the change in trade intensity.

To test whether changing trade patterns actually matter for job turnover rates we use a simple regression-based approach which allows us to consider both import and export effects simultaneously while also controlling for time and industry effects. As Figure 1 shows, time effects are likely to be important because job turnover rates were declining over the sample period, whereas import and export intensities were increasing.[11] To estimate the impact of the change in trade intensity on job creation we estimate the following model, appropriately weighted by the weights given in equation (2).

$$g_{it}^{+} = \alpha + \sum_{q=2}^{5} \beta_q M_{qj} + \sum_{q=2}^{5} \gamma_q X_{qj} + \delta_t + \epsilon_{it},$$

where g_{it}^{+} is equal to g_{it} for those firms with $g_{it} > 0$ and zero for all other firms. The variables M_{qj} are dummies which indicate whether industry j is in change in import intensity quintile q. Similarly, X_{qj} are dummies which indicate whether industry j is in change in export intensity quintile q. Estimates of β_q and γ_q can therefore be

[9]Trade data is taken from ONS series MQ10; output data is computed directly from the BSD. The import penetration and export share are computed exactly as in Davis *et al.* (1996a, table 3.5).

[10]Both Davis *et al.* (1996a) and Levinsohn (1999) classify industries according to their average import and export intensity. However, Klein *et al.* (2003, pp. 73–74) argue that one would not expect any relationship between the *levels* of trade intensity and job turnover, but rather the changes… 'there is no well established theoretical or empirical reason for a connection between these two sets of underlying factors that determine the long-run averages'. We also examined quintiles in the level of intensity, but found no systematic relationship to job creation or job destruction.

[11]Levinsohn (1999) also uses a regression-based approach because it allows one to calculate correlations conditional on macroeconomic time effects.

used to test whether job creation is significantly different in different quintiles. Job destruction results can be recovered in a similar way by defining g_{it}^{-} as equal to g_{it} for those firms with $g_{it} < 0$ and zero otherwise.

Table 5 reports our basic results. The first column shows very little systematic relationship between job creation rates and the change in trade exposure. In fact, industries with an increase in export intensity have, if anything, lower rates of job creation. But recall from Figure 3 that job creation rates actually vary little between industries, so it seems unlikely that trade exposure would have much effect. The second column, however, provides some tentative evidence that change in trade exposure impacts on job destruction. Industries in the highest import quintile have significantly higher job destruction rates (more negative), whereas industries in the highest export quintile have significantly lower job destruction rates (less negative). We would stress that these results are only suggestive and descriptive; we have not developed a model of how trade patterns would affect job flows. In addition, variation in industry-level variables such as change in trade intensity explains only a tiny fraction of the between-firm variation in job creation and destruction.

Job reallocation by region

Table 6 documents average job turnover by region. As before, it is instructive to plot JC and JD rates for each region against each other, the results of which are presented in Figure 4.

The regional differences between manufacturing and services are striking. All regions experienced employment growth in services and employment decline in

TABLE 5

Job creation and destruction rates by import and export intensity

	Job creation		*Job destruction*	
	Coefficient	*SE*	*Coefficient*	*SE*
α	0.135	(0.010)***	−0.177	(0.010)***
Δ Import intensity quintile				
β_2	0.003	(0.009)	0.006	(0.007)
β_3	0.018	(0.014)	−0.011	(0.011)
β_4	−0.001	(0.010)	−0.001	(0.009)
β_5	0.012	(0.014)	−0.033	(0.011)***
Δ Export intensity quintile				
γ_2	−0.006	(0.013)	0.011	(0.010)
γ_3	−0.029	(0.012)**	0.010	(0.010)
γ_4	−0.020	(0.012)	0.005	(0.009)
γ_5	−0.028	(0.014)**	0.020	(0.010)*

Notes: Standard errors are clustered to the four-digit SIC level. ***, ** and * denote significances at the 1, 5 and 10% levels, respectively. Regressions include year and two-digit industry fixed effects.

TABLE 6

Job creation and destruction rates by region

Region	*JC*	*−JD*	*JR*	*NR*	*XR*
(a) Manufacturing (Section D)					
Northeast	0.103	−0.158	0.261	−0.056	0.205
Northwest	0.094	−0.134	0.229	−0.040	0.189
Yorks. & Humberside	0.095	−0.137	0.232	−0.042	0.191
East Midlands	0.097	−0.134	0.231	−0.037	0.193
West Midlands	0.094	−0.146	0.240	−0.053	0.187
East of England	0.092	−0.117	0.210	−0.025	0.185
London	0.124	−0.180	0.304	−0.056	0.247
Southeast	0.102	−0.123	0.225	−0.021	0.203
Southwest	0.113	−0.133	0.245	−0.020	0.226
Wales	0.093	−0.119	0.212	−0.027	0.185
Scotland	0.109	−0.147	0.256	−0.039	0.217
Northern Ireland	0.089	−0.100	0.189	−0.011	0.178
All regions	0.100	−0.137	0.238	−0.037	0.201
(b) Services (Sections G–K)					
Northeast	0.143	−0.138	0.281	0.005	0.276
Northwest	0.164	−0.134	0.298	0.030	0.267
Yorks. & Humberside	0.146	−0.116	0.262	0.030	0.232
East Midlands	0.136	−0.112	0.248	0.023	0.225
West Midlands	0.154	−0.131	0.285	0.023	0.262
East of England	0.149	−0.117	0.267	0.032	0.235
London	0.160	−0.148	0.309	0.012	0.297
Southeast	0.170	−0.152	0.322	0.017	0.305
Southwest	0.149	−0.135	0.284	0.015	0.269
Wales	0.166	−0.143	0.308	0.023	0.285
Scotland	0.155	−0.127	0.282	0.027	0.254
Northern Ireland	0.140	−0.109	0.249	0.031	0.218
All regions	0.156	−0.136	0.291	0.020	0.271
(c) Total (Sections A–K)					
Northeast	0.135	−0.143	0.277	−0.008	0.269
Northwest	0.149	−0.136	0.284	0.013	0.272
Yorks. & Humberside	0.136	−0.123	0.258	0.013	0.246
East Midlands	0.128	−0.121	0.248	0.007	0.241
West Midlands	0.138	−0.138	0.276	0.001	0.276
East of England	0.138	−0.120	0.259	0.018	0.241
London	0.159	−0.151	0.310	0.008	0.303
Southeast	0.154	−0.146	0.300	0.008	0.292
Southwest	0.145	−0.136	0.282	0.009	0.273
Wales	0.144	−0.136	0.280	0.007	0.272
Scotland	0.147	−0.133	0.280	0.013	0.267
Northern Ireland	0.132	−0.109	0.242	0.023	0.219
All regions	0.146	−0.137	0.283	0.009	0.274

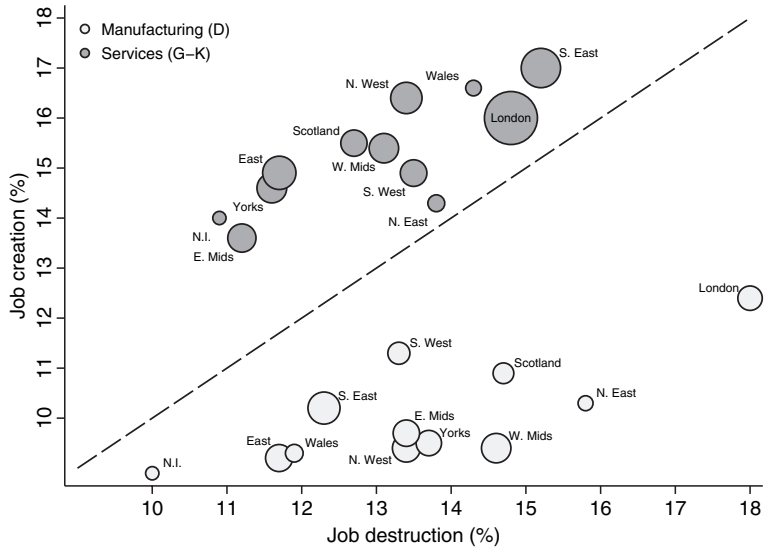

Figure 4. Job reallocation rates by region

manufacturing. Again, it is also clear that gross job reallocation is considerably lower in manufacturing in most regions, with the exception of London, which has experienced high job destruction rates. Manufacturing industries declined fastest in the North-East, West Midlands and London, whereas service industries expanded fastest in the North-West, Scotland, the East of England, Yorkshire and Northern Ireland. London and the South-East have the highest gross job reallocation rates in the service sector. As with the pattern across industries, there is a strong positive association between job creation and destruction, and very little association between job creation and net employment growth.

V. Job turnover and labour productivity growth

What role does job turnover play in productivity growth? We might expect that less productive jobs are those that are destroyed, to be replaced by more productive openings. Recent cross-country work by Bartelsman, Haltiwanger and Scarpetta (2008) argues that aggregate differences in productivity between countries can in part be explained by the correlation between the size of individual firms and their productivity. One mechanism by which this correlation arises is by the growth and entry of more productive firms, and the decline and exit of less productive firms.

Our dataset does not contain information on firms' inputs apart from labour, so the only measure of productivity we can use is output per worker. Nevertheless, using this measure we can decompose changes in productivity into changes owing to within-firm restructuring, between-firm restructuring and entry and exit.[12] Various

[12]This method has been used by, amongst others, Brown and Earle (2002) and De Loecker and Konings (2006) to decompose the productivity effect of job turnover in post-Socialist economies.

different decompositions are possible; we use that suggested by Foster, Haltiwanger and Krizan [1998, equation (2)]. Define average productivity of industry j at time t as

$$P_{jt} = \sum_{i \in j} s_{it} p_{it},$$

where s_{it} is the share of firm i in industry j and p_{it} is the firm-level measure of productivity. The change in P_{jt} is then decomposed as follows:

$$\Delta P_{jt} = \sum_{i \in \mathcal{C}} s_{it-1} \Delta p_{it} + \sum_{i \in \mathcal{C}} (p_{it-1} - P_{jt-1}) \Delta s_{it} + \sum_{i \in \mathcal{C}} \Delta p_{it} \Delta s_{it} + \left(\sum_{i \in \mathcal{N}} s_{it} (p_{it} - P_{jt-1}) - \sum_{i \in \mathcal{X}} s_{it-1} (p_{it-1} - P_{jt-1}) \right). \quad (7)$$

In this expression $\mathcal{C}$ is the set of firms which exist at the beginning and the end of the sample period, $\mathcal{N}$ is the set of firms which enters and $\mathcal{X}$ is the set of firms which exits. The first component of equation (7) is the within-firm change in labour productivity between $t-1$ and t, weighted by employment shares at $t-1$. The second component is the between-firm change in employment shares weighted by productivity at $t-1$. The third term is a cross-term between changes in productivity and changes in employment shares. The final term in brackets is the net effect of entry and exit on productivity.

To interpret these four terms, first consider the case where continuing firms' employment shares remain constant over time, so that $\Delta s_{it} = 0$. In this case, the second and third terms disappear and any productivity growth of continuing firms would be entirely a 'within' phenomenon. Second, consider the case where continuing firms' productivity is constant, so that $\Delta p_{it} = 0$. In this case, the first and third terms will disappear and any productivity growth will be a 'between'-firm phenomenon. The second term will be positive if firms whose productivity is initially greater than the average within that industry (those for whom $p_{it-1} - P_{jt-1} > 0$) grow faster than firms whose productivity is less than the average. The third, cross term, will be negative if increases in labour productivity are associated with falls in employment shares, which is the case if labour productivity grows via layoffs. Finally, the net entry term will be positive if new firms are more productive than the average incumbent or if exiting firms are less productive than the average.

We calculate real log sales per worker for each firm in our sample at the beginning and end of the sample period. Sales are deflated by a producer price index.[13] We then calculate equation (7) for each four-digit industry. The results are shown in Table 7, averaged over all four-digit industries and over various aggregate sectors.

[13] We use the ONS series PLLU 'Producer Price Index' for firms in manufacturing and the series DZZI 'Service Producer Price Index' for firms in service industries.

TABLE 7

Productivity growth decomposition

			Proportion of productivity change			
		$\Delta \log P^*$	*Within*	*Between*	*Cross*	*Net entry*
D	Manufacturing	0.024	0.46	0.29	−0.06	0.31
F	Construction	0.020	0.27	0.46	−0.35	0.62
G	Wholesale and retail trade	0.013	0.14	0.64	−0.28	0.50
H	Hotels and restaurants	0.019	0.24	0.13	−0.20	0.83
I	Transport, storage and communications	0.020	0.59	0.17	−0.18	0.42
J	Financial intermediation	0.042	0.13	0.32	−0.01	0.55
K	Renting, real estate and business activities	0.030	0.44	0.24	−0.24	0.57
	All sectors (D, F, G, H, I, J, K)	0.023	0.37	0.30	−0.20	0.53

Note: *Annual average over 1997–2008.

In comparison with previous decompositions of UK productivity growth our estimates cover almost all UK firms. Disney, Haskel and Heden (2003), for example, only cover manufacturing plants over the period 1980–92. They find that about 50% of the growth in labour productivity is because of net entry, and very little is due to a between-plant effect. We calculate a lower net entry effect for manufacturing (31%) and a higher between-firm effect. This may reflect the less turbulent period of our data. It may also reflect the fact that Disney *et al.* (2003) analyse establishments rather than firms.

Over all sectors, net entry contributes 53% of all growth in output per worker. This is because exiting firms have lower labour productivity than the average firm, and entering firms have higher productivity than the average. The net entry component is most important in construction (62%) and hotels and restaurants (83%), which is intuitive as entry and exit of firms is more common in these sectors. Net entry is less important in sectors with larger firms and less firm turnover, such as transport (42%) and manufacturing (31%).[14]

VI. The role of firm size

As was noted in Section I, it is often claimed that small firms contribute disproportionately to the creation of new jobs. In the United Kingdom, for example, Daly *et al.* (1991) claim that firms employing fewer than 10 people were responsible for about half of all net job creation in the late 1980s, despite employing only about 20% of the workforce. Could a differing distribution of firm sizes explain the different rates of job creation between and within the manufacturing and service sectors? This is a

[14]As Foster *et al.* (1998) make clear, different decompositions can produce different results. We have also calculated the decomposition using the method suggested by Griliches and Regev (1995), and find, as expected, that the within effect is reduced and the net entry component is increased.

possibility, since, as Table 1 documents, firms in services are on average half the size of those in manufacturing.

This claim is not without controversy. DHS (1993, 1996b) find that for manufacturing plants in the United States, job creation *and* job destruction rates are substantially higher for small plants. But large plants dominate the creation and destruction of jobs simply because they account for the great majority of manufacturing employment. Overall, DHS find no systematic relationship between plant size and net employment growth. Finally, they note that jobs created in larger plants tend to last longer. DHS reconcile their results by identifying three methodological problems which they claim causes problems for the conventional wisdom. The first is the 'size distribution fallacy'. They argue that changes in the share of employment by firm size are misleading because over time firms can change their size. A big firm which shrinks, and which is reclassified into a small firm, will apparently contribute to small firm job creation. However, all the studies considered here use longitudinal data on firms or plants, and so this criticism does not apply. In addition, it is not obvious that this problem will tend to bias the results towards small firms, as small firms also get bigger.

The second problem is in the reporting of the share of net rather than gross job creation. Consider an economy which has a small increase in the total number of jobs. Any group of firms which is growing will apparently contribute a very large 'share' (probably in excess of 100%) of total net job creation. However, this group of firms may or may not have created a large number of jobs in gross terms. DHS therefore recommend reporting gross job creation rates. Once again, however, there seems no reason why this problem should bias results in favour of small firms in particular.

The third problem is the familiar 'regression fallacy' (Friedman, 1992). Measurement error or transitory fluctuations of employment implies that firms classified as small at t are more likely to have experienced a negative fluctuation in that year, whereas firms classified as large are more likely to have experienced a positive fluctuation. Thus between t and $t+1$ small firms are more likely to grow, and large firms to shrink. One possible solution to this problem is to use average firm size over the entire sample period to categorize firms, rather than initial firm size. DHS (1993, table 2) show that this can have a large effect on estimates of gross and net job creation rates by firm size.

However, others including Baldwin and Picot (1995), Gallagher and Robson (1995) and Davidsson *et al.* (1998) have suggested that these methodological problems are probably of little consequence, and that small firms do indeed contribute disproportionately to the creation of new jobs. Davidsson *et al.* (1998) dismiss the first two problems because they do not necessarily impart a bias in any particular direction. They also argue that the proposed solution to the 'regression fallacy' (using average firm size rather than initial firm size) is problematic because growth or decline over the sample period inevitably affects average size, unless all changes in size are transitory fluctuations or the result of measurement error. Instead, Baldwin and Picot (1995) therefore suggest using average size over some period *before* the current year.

The proportion of job turnover by firm size

We investigate these issues in Table 8, with Table 9 providing some summary statistics in which we classify 'small' firms as those employing less than 100. Several points are worthy of note. First, small firms employ a substantial proportion of the workforce: between 38 and 52% of all workers. DHS argue that large firms are important because they account for the bulk of employment, but this is not the case in the United Kingdom.[15]

TABLE 8

Proportions of job creation and destruction by firm size

	Share of	*Share of* JC_t			*Share of* JD_t		
	employment	*Total*	*Growth*	*Entry*	*Total*	*Decline*	*Exit*
(a) Initial firm size (N_1)							
0–19	0.39	0.65	0.50	1.00	0.51	0.45	0.58
20–49	0.07	0.04	0.06	0.00	0.06	0.06	0.06
50–99	0.05	0.03	0.04	0.00	0.04	0.04	0.04
100–249	0.07	0.05	0.07	0.00	0.07	0.07	0.07
250–499	0.06	0.04	0.05	0.00	0.05	0.06	0.05
500–999	0.06	0.04	0.05	0.00	0.05	0.06	0.04
1,000–2,499	0.07	0.05	0.07	0.00	0.06	0.07	0.05
2,500–4,999	0.05	0.03	0.04	0.00	0.04	0.05	0.04
$\geq$ 5,000	0.17	0.08	0.11	0.00	0.11	0.15	0.07
(b) Average current year firm size ($N_t + N_{t-1}/2$)							
0–19	0.23	0.33	0.23	0.57	0.32	0.23	0.43
20–49	0.09	0.08	0.09	0.08	0.09	0.08	0.09
50–99	0.06	0.06	0.07	0.06	0.07	0.07	0.07
100–249	0.09	0.09	0.10	0.06	0.10	0.10	0.09
250–499	0.07	0.06	0.07	0.04	0.07	0.08	0.07
500–999	0.07	0.06	0.07	0.04	0.07	0.08	0.06
1,000–2,499	0.08	0.08	0.10	0.06	0.09	0.10	0.07
2,500–4,999	0.06	0.05	0.06	0.03	0.06	0.07	0.04
$\geq$ 5, 000	0.25	0.17	0.22	0.07	0.14	0.20	0.07
(c) Average previous year firm size ($N_{t-1} + N_{t-2}/2$)							
0–19	0.27	0.55	0.36	1.00	0.30	0.23	0.38
20–49	0.08	0.06	0.09	0.00	0.09	0.08	0.09
50–99	0.06	0.04	0.06	0.00	0.07	0.07	0.07
100–249	0.08	0.06	0.08	0.00	0.10	0.10	0.09
250–499	0.06	0.05	0.07	0.00	0.07	0.08	0.07
500–999	0.06	0.04	0.06	0.00	0.07	0.08	0.06
1,000–2,499	0.08	0.05	0.07	0.00	0.09	0.10	0.07
2,500–4,999	0.06	0.04	0.06	0.00	0.06	0.07	0.04
$\geq$ 5, 000	0.24	0.11	0.16	0.00	0.16	0.20	0.11

[15]This is partly because DHS are studying manufacturing plants only, which are larger on average. But even in manufacturing, small firms in the United Kingdom account for 37–44% of employment.

TABLE 9

Share of job turnover by small firms (employment < 100)

	Share of employment	JC_t			JD_t		
		Total	*Growth*	*Entry*	*Total*	*Decline*	*Exit*
Initial firm size	0.52	0.73	0.60	1.00	0.61	0.55	0.69
Current year average	0.38	0.48	0.38	0.70	0.48	0.38	0.59
Previous year average	0.41	0.65	0.50	1.00	0.45	0.38	0.54

Second, following Baldwin and Picot (1995) we investigate the relationship between firm size and job turnover using three different measures of firm size.

1. *Initial firm size* classifies firms by their employment in period 1 (1997). Firms which do not exist in 1997 therefore automatically fall into the smallest firm size category and any entry is ascribed to firms in this group by definition. This is likely to suffer from the regression to the mean fallacy.
2. *Average current year firm size* classifies firms by their average size over the period of employment change: $(N_t + N_{t-1})/2$. This measure suffers from the fact that growth or decline affects the measure of size used, because it includes current size.
3. *Average previous year firm size* classifies firms by their average size *before* measuring the change in employment: $(N_{t-1} + N_{t-2})/2$.

In Tables 8 and 9 we also split job creation into 'growth' and 'entry', and job destruction into 'decline' and 'exit'. This is important because it can be rather misleading to look at total job creation rates by firm size, because firms which enter must, by definition, have zero employment before they enter. Therefore, by definition, all jobs created by new entrants are classified as occurring in small firms.

The apparent significance of small firms in job reallocation does depend on the measure used. Using initial firm size inflates the importance of small firms: by this measure small firms account for 73% of job creation and 61% of job destruction. As noted, this is partly because new entrants are by definition classified as small and so 100% of entry is by small firms. However, even if we focus only on job creation in existing firms, small firms account for a greater proportion of job creation than large firms. If we use *average current year firm size* small firms account for 48% of creation and 48% of destruction. Our preferred measure (for the reasons outlined before), *average previous year firm size*, suggests that small firms account for 65% of job creation and 45% of job destruction. In short, small firms *do* account for a greater proportion of job creation than their employment share, whatever measure is used, and a slightly greater proportion of job destruction. However, much of the difference in job creation rates is because of the classification of entrants as small firms.

We can compare our results with the cross-country study of Haltiwanger, Scarpetta and Schweiger (2006); see in particular their table 4. Consistent with their results

(which exclude the UK) we find that the bulk of job turnover is accounted for by small (<20 employees) and large (100+ employees) firms.

The persistence of job turnover by firm size

The disproportionately large contribution of small firms to job turnover might be misleading if there are systematic differences in the persistence of job turnover. For example, jobs created in small firms might be less secure than those in larger firms. To examine this, we follow Davis and Haltiwanger (1992) who suggest the following measure of persistence:

$$p_{i,x} = \frac{N_{i,t+x} - N_{i,t-1}}{N_{i,t} - N_{i,t-1}}. \tag{8}$$

So, for example, if $p_{i,1} = 0.8$ then of those jobs created between $N_{i,t-1}$ and $N_{i,t}$, 80% have survived up to $t+1$. Because it is not possible to identify a particular job and follow it through time, equation (8) simply calculates the fraction of the change in employment which persists beyond the initial change. Results are shown in Table 10.

TABLE 10

Persistence rates of job creation and destruction by firm size

	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
(a) Persistence of jobs created at t					
0–19	0.75	0.58	0.47	0.38	0.34
20–49	0.80	0.66	0.57	0.47	0.41
50–99	0.75	0.60	0.50	0.42	0.37
100–249	0.68	0.54	0.45	0.38	0.34
250–499	0.68	0.53	0.44	0.37	0.34
500–999	0.68	0.52	0.43	0.37	0.33
1,000–2,499	0.68	0.53	0.45	0.38	0.35
2,500–4,999	0.71	0.56	0.48	0.43	0.41
$\geq 5,000$	0.65	0.52	0.44	0.39	0.36
All firms	0.75	0.58	0.47	0.39	0.34
(b) Persistence of jobs destroyed at t					
0–19	0.92	0.89	0.87	0.85	0.83
20–49	0.91	0.86	0.82	0.79	0.77
50–99	0.87	0.81	0.77	0.74	0.73
100–249	0.81	0.74	0.70	0.68	0.66
250–499	0.81	0.74	0.70	0.68	0.66
500–999	0.80	0.73	0.69	0.68	0.65
1,000–2,499	0.80	0.72	0.68	0.65	0.62
2,500–4,999	0.77	0.70	0.66	0.64	0.59
$\geq 5,000$	0.75	0.66	0.60	0.57	0.56
All firms	0.92	0.89	0.86	0.84	0.82

Overall, we find that 75% of jobs created by firms between $t-1$ and t still exist at $t+1$, and 93% of job destruction persists to $t+1$.[16] The higher persistence rate of job destruction is partly accounted for by the fact that a large proportion of job destruction arises because of firm exit, and is therefore permanent.

Figure 5 plots persistence rates for three firm-size categories. Looking first at job creation (top panel), we find that the persistence rates of jobs created in small

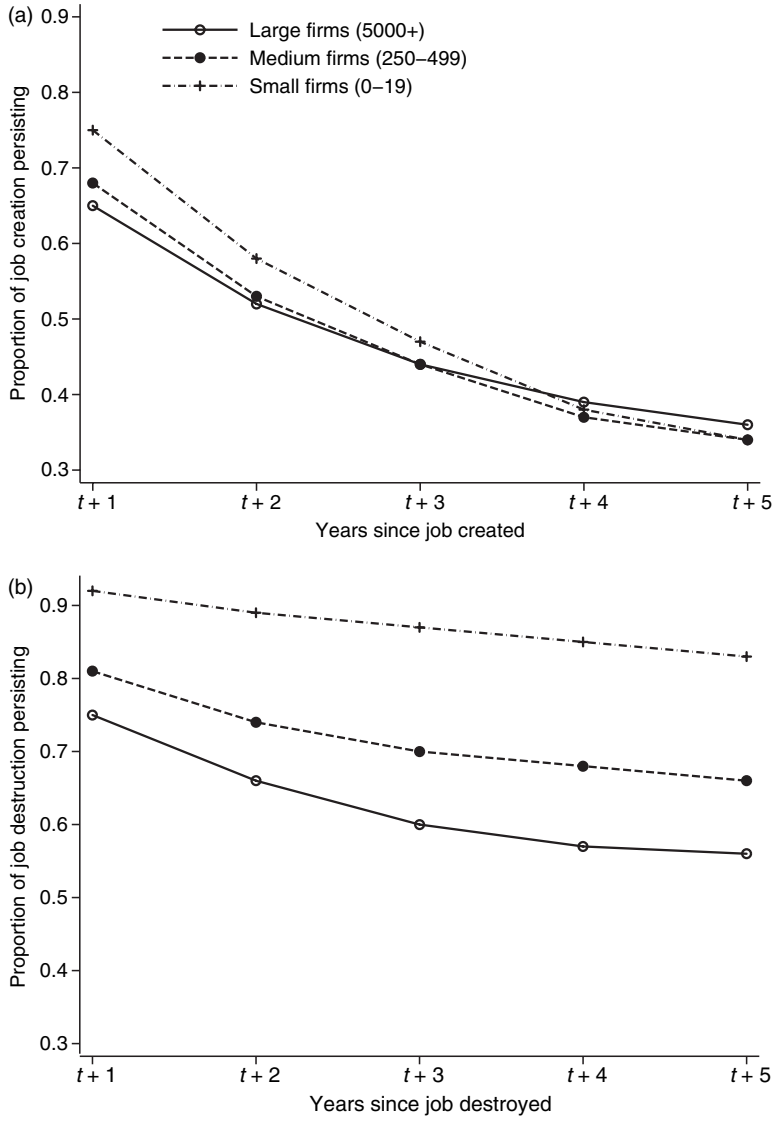

Figure 5. Job creation and destruction persistence rates

[16]This compares to rates of 68 and 81% estimated for the United States by Davis and Haltiwanger (1992, table III).

firms are *not* lower than those created in large firms, despite the higher exit rate of small firms. This suggests that, at least initially, job creation in large firms is more often reversed. However, as time passes the persistence rates of small firms falls faster than for large firms. The bottom panel of Figure 5 shows the persistence rates for job destruction. A much larger proportion of jobs destroyed by small firms are the result of firm exit, which means that the persistence rate remains much higher for small firms throughout. In essence, Figure 5 tells us that changes in employment (both positive and negative) are more likely to be reversed in large than in small firms.

VII. Conclusion

Using a newly available data source, we have provided the first comprehensive estimates of job reallocation across all private sector firms in the United Kingdom.[17] Our estimates are also the first to look explicitly at enterprises rather than statistical units or establishments. One might argue that changes in employment at the firm level (as opposed to changes at plant level) are more likely to correspond to genuine economic consequences for workers in terms of job displacement and job finding rates.

Over the period in question, approximately 50,000 jobs were created and approximately 47,000 destroyed *each week*. The service sector accounts for over 70% of this turnover, creating about 38,000 jobs per week and destroying about 33,000. The entry of new firms accounts for about 30% of job creation, whereas the exit of firms accounts for 45% of all jobs destroyed. Despite being an expanding sector, job destruction *rates* are not lower, on average, in services. Of course, job creation rates in services must therefore be correspondingly higher. Indeed there is a strong positive association between job creation and destruction rates in services. This correlation is much weaker in manufacturing: it appears that the decline of manufacturing industries is strongly associated with the job destruction rate. We find some tentative evidence that job destruction is higher in industries which experienced the fastest growth in import intensity over the sample period. However, industry characteristics in general can explain only a tiny fraction of total job reallocation; the vast majority of job reallocation occurs within industries.

Job reallocation, and in particular the reallocation caused by firm entry and exit, has significant impacts on productivity growth. The entry of new firms which are more productive than the average incumbent (and the exit of firms which are less productive) contributes more than half of the growth of labour productivity. This role of net entry is significantly higher in service industries.

We find that small firms account for about 65% of jobs created and 45% of jobs destroyed. The contribution of small firms to job reallocation is therefore greater than their share of employment, whatever measure of firm size is used. The jobs created

[17]Recent cross-country comparison by Haltiwanger *et al.* (2008) and Bassanini and Marianna (2009) are hampered by the fact that UK data only covers manufacturing industries.

by small firms are no less persistent than those created by large firms, despite the fact that small firms are more likely to exit.

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References

Abowd, J., Corbel, P. and Kramarz, F. (1999). 'The entry and exit of workers and the growth of employment: an analysis of French establishments', *The Review of Economics and Statistics*, Vol. 81, pp. 170–187.

Baldwin, J. and Picot, G. (1995). 'Employment generation by small producers in the Canadian manufacturing sector', *Small Business Economics*, Vol. 7, pp. 317–331.

Barnes, M. and Haskel, J. (2002). 'Job creation, job destruction and the contribution of small businesses: evidence for UK manufacturing', Queen Mary College Department of Economics Working Paper 461, London.

Bartelsman, E., Haltiwanger, J. and Scarpetta, S. (2008). 'Cross country differences in productivity: the role of allocative efficiency', mimeo.

Bassanini, A. and Marianna, P. (2009). 'Looking inside the perpetual motion machine: how industry, firm and worker characteristics shape job and worker flows', OECD Social, Employment and Migration Working Paper 95.

Bernard, A., Redding, S. and Schott, P. (2007). 'Comparative advantage and heterogeneous firms', *Review of Economic Studies*, Vol. 74, pp. 31–66.

Blanchflower, D. and Burgess, S. (1996). 'Job creation and destruction in Great Britain in the 1980s', *Industrial and Labor Relations Review*, Vol. 50, pp. 17–38.

Brown, J. and Earle, J. (2002). 'Job reallocation and productivity growth under alternative economic systems and policies: evidence from the Soviet transition', IZA Discussion Paper 644, Bonn.

Daly, M., Campbell, G., Robson, G. and Gallagher, C. (1991). 'Job creation 1987–1989: the contributions of small and large firms', *Employment Gazette*, Vol. 99, pp. 589–596.

Davidsson, P., Lindmark, L. and Olofsson, C. (1998). 'The extent of overestimation of small firm job creation – an empirical examination of the regression bias', *Small Business Economics*, Vol. 11, pp. 87–100.

Davis, S., Faberman, J., Haltiwanger, J., Jarmin, R. and Miranda, J. (2008). 'Business volatility, job destruction and unemployment', NBER Working Paper 14300, Cambridge, MA.

Davis, S. and Haltiwanger, J. (1992). 'Gross job creation, gross job destruction and employment reallocation', *Quarterly Journal of Economics*, Vol. 107, pp. 819–863.

Davis, S., Haltiwanger, J. and Schuh, S. (1993). 'Small business and job creation: dissecting the myth and reassessing the facts', NBER Working Paper 4492, Cambridge, MA.

Davis, S., Haltiwanger, J. and Schuh, S. (1996a). *Job Creation and Destruction*, MIT Press, Cambridge, MA.

Davis, S., Haltiwanger, J. and Schuh, S. (1996b). 'Small business and job creation: dissecting the myth and reassessing the facts', *Small Business Economics*, Vol. 8, pp. 297–315.

De Loecker, J. and Konings, J. (2006). 'Job reallocation and productivity growth in a post-socialist economy: evidence from Slovenian manufacturing', *European Journal of Political Economy*, Vol. 22, pp. 388–408.

Disney, R., Haskel, J. and Heden, Y. (2003). 'Restructuring and productivity growth in UK manufacturing', *Economic Journal*, Vol. 113, pp. 666–694.

Foster, L., Haltiwanger, J. and Krizan, C. (1998). 'Aggregate productivity growth: lessons from microeconomic evidence', NBER Working Paper 6803, Cambridge, MA.

Friedman, M. (1992). 'Do old fallacies ever die?' *Journal of Economic Literature*, Vol. 30, pp. 2129–2132.

Gallagher, C., Daly, M. and Thomason, J. (1990). 'The growth of UK companies 1985–1987 and their contribution to job generation', *Employment Gazette*, Vol. 98, pp. 92–98.
Gallagher, C. and Robson, G. (1995). 'Small business and job creation – an even further dissection of the Davis, Haltiwanger and Schuh working paper', *International Small Business Journal*, Vol. 13, pp. 64–67.
Griliches, Z. and Regev, H. (1995). 'Productivity and firm turnover in Israeli industry: 1979–1988', *Journal of Econometrics*, Vol. 65, pp. 175–203.
Haltiwanger, J., Scarpetta, S. and Schweiger, H. (2006). 'Assessing job flows across countries: the role of industry, firm size and regulations', IZA Discussion Paper 2450, Bonn.
Haltiwanger, J., Scarpetta, S. and Schweiger, H. (2008). 'Assessing job flows across countries: the role of industry, firm size and regulations', NBER Working Paper 13920, Cambridge, MA.
Klein, M., Schuh, S. and Triest, R. (2003). *Job Creation, Job Destruction and International Competition*, W.E. Upjohn Institute.
Konings, J. (1995). 'Job creation and destruction in the UK manufacturing sector', *Oxford Bulletin of Economics and Statistics*, Vol. 57, pp. 5–24.
Levinsohn, J. (1999). 'Employment responses to international liberalization in Chile', Vol. 47, pp. 321–344.
Melitz, M. J. (2003). 'The impact of trade on intra-industry reallocations and aggregate industry productivity', *Econometrica*, Vol. 71, pp. 1695–1725.
Mortensen, D. and Pissarides, C. (1999). 'Job reallocation, employment fluctuations and unemployment', in Taylor J. and Woodford M. (eds), *Handbook of macroeconomics*, chapter 18, Vol. 1, Elsevier, Amsterdam, pp. 1171–1228.
Organization for Economic Cooperation and Development (OECD) (1994). 'Employment adjustment, workers and unemployment', in *Employment Outlook*, OECD, Paris, pp. 161–184.
Office for National Statistics (ONS) (2001). 'Review of the inter-departmental business register', National Statistics Quality Review Series No. 2, London.