

Beyond “Manucentrism” – Some Fresh Facts About Job and Worker Flows*

by

Paul Bingley¹, Tor Eriksson^{1,2**}, Axel Werwatz^{1,3} and Niels Westergård-Nielsen^{1,2}

¹Center for Labour Market and Social Research, Aarhus University, DK-8000 Aarhus C, Denmark,

²Department of Economics, Aarhus School of Business, Fuglesangs Allé 20, DK-8210 Aarhus V, Denmark and ³Institute of Statistics, Department of Economics, Humboldt University Berlin, Germany.

Abstract: This paper gives a comprehensive picture of job and worker flows for the entire Danish economy. We exploit a unique central administrative register encompassing *all* employees of *all* workplaces across *all* sectors throughout two business cycles. This enables us to broaden the focus of the previous literature about job and worker flows which has been concerned exclusively with larger workplaces, especially in the manufacturing sector. We find that manufacturing data underestimate the levels of flows in the other private sector industries as well as the role of small workplaces in the job and worker reallocation processes. As for the cyclicity of job and worker flows, the results of Davis and Haltiwanger are confirmed for the whole Danish economy and the manufacturing industry, but not for the private sector. Thus, the results are sensitive to the exclusion of the large public sector.

JEL classifications: J21, J31, J42, J63

Keywords: Job flows, worker flows, cyclicity.

* Financial support from the Danish Social Science Research Council and the Research Foundation of Aarhus University is gratefully acknowledged. Thanks to Søren Leth-Sørensen and Jørn Schmidt of Statistics Denmark Aarhus branch for creating the original data. We have received helpful comments on earlier versions of the paper from Jordi Gali, John Haltiwanger, Dan Hamermesh and participants at the 1999 CAED and EALE meetings in Hague and Regensburg, respectively.

** Corresponding author: Phone: +45 8948 6404, Fax: +45 8615 5175, E-mail: tor@hha.dk

1. Introduction

In recent years, several studies have described job and worker flows for various countries based on matched employer-employee data. See, for instance, Davis and Haltiwanger (1992) and Anderson and Meyer (1994) for the U.S., Hamermesh, Hassink and van Ours (1996) for the Netherlands, Abowd, Corbel and Kramarz (1996) for France and Albæk and Sørensen (1998) for Denmark. These studies document how individual enterprises adjust their workforce in response to the multitude of shocks they are exposed to and the implications of this micro-level adjustment process for aggregate, macro-level quantities such as total job creation and total job destruction in an economy. The findings of this largely data-driven research have produced “stylized facts” about such features of job and worker flows as their magnitude, persistence, cyclicalities, distribution among individual workplaces. In several cases, these empirical findings have been at odds with assumptions and implications of existing theoretical models and have challenged theorists to develop new models that are more in line with these facts.

Hamermesh et.al. (1996), for instance, find substantial (and frequently simultaneous) hiring and firing activities in most firms, often only loosely related to the firms’ net employment change. These patterns cannot be explained by classical labour demand theory, which either ignores **gross** worker flows altogether or rules out that firms may be simultaneously both hiring **and** firing. Virtually all empirical studies on job and worker flows find that job and worker turnover at the workplace level is highly idiosyncratic, seemingly unrelated to observable workplace characteristics such as industry, region or size. Boeri (1996), calls on theorists to provide models that can explain “this tremendous heterogeneity of workplace-level employment dynamics”, which is in stark contrast to the notion of the “representative firm”.

Some recent papers ask whether the stylized facts arising from selected studies on job and worker flows really can be generalized. Boeri (1996) observes that quite an active theoretical literature has emerged to explain the counter-cyclical of job reallocation, a fact that has only been found in U.S. data which arguably underrepresents the small business sector. Excluding the smallest business units may bias the analysis against job creation. Hamermesh (1998) notes that, mainly for reasons of data availability, empirical findings have almost exclusively focused on the manufacturing sector and wonders whether this “manucentrism” has produced a rather unbalanced view of the sources of job growth. In many countries employment in the manufacturing has been declining and consequently, this sector may under-represent economy-wide job creation and over-represent economy-wide job destruction.

Indeed, all the aforementioned studies are nationally unrepresentative in one of two ways: they are either limited to data from the manufacturing sector (Davis and Haltiwanger (1992), Albæk and Sørensen (1998)) or they do not have access to observations on small workplaces¹. In fact, the only study we aware of, which examines the uniqueness of the manufacturing sector, is Foote (1998), in which data from the state of Michigan are analysed.

The aim of this paper is to provide a comprehensive picture of job and worker flows for the entire Danish economy. We make use of a unique data set drawn from the register-based Integrated Database for Labor Market Research (IDA) created by Statistics Denmark and which contains information on *all* employees of *all* workplaces in *all* sectors. Our data from 1980-95 spans two full business cycles. Thus, in contrast to Albaæk and Sørensen (1998),

¹ More precisely, Anderson and Meyer (1994), Hamermesh et. al. (1996), Abowd et. al. (1996) observe workplaces with more than 50, 10 and 50 employees, respectively.

who replicate US manufacturing studies to Denmark, we exploit considerably more of the information available in the IDA data set.

We will consider the following “stylized findings” of previous research: (1) **magnitude of flows** - there are very substantial job- and worker-flows during all phases of the business cycle, (2) **cyclicalities of flows** – countercyclical job destruction dominates procyclical job creation, making their sum (job reallocation) countercyclical. In line with the comparative advantage of our data we will frequently break down by sector and size classes to assess whether previous results may have given a biased picture of the whole economy by over-representing the manufacturing sector and under-representing small businesses.

The next section briefly describes the data used; section 3 contains the results regarding the magnitude of job and worker flows; section 4 looks at the cyclicalities of flows. Section 5 concludes.

2. Data and definitions

We use data drawn from the “Integrated Database for Labour Market Research” (IDA) maintained by Statistics Denmark . IDA includes register-based information on all workplaces and residents in Denmark.² Persons and workplaces are matched at the end of November of each year and we are able to obtain a comprehensive snapshot of all workplaces in Denmark and all of their employees at this point in time of each year from 1980 to 1995. Both workplaces and persons are assigned a unique identification number and can be followed over time.

All flows calculated in this paper are based on comparing worker and workplace matches in consecutive Novembers. Hence, employment relationships (and associated flows) that last from, say, January to April of any given year are not picked up. Our figures are therefore lower bounds for actual flows. We focus on a worker's primary end-of-November employment relationship and ignore all other employment relationships of individuals that work multiple jobs at this time.³

As in previous studies in the job and worker flows literature, the data do not allow us to directly identify the job a worker is paid to do. We will refer to end-of-November workplace size as the "number of jobs" in the workplace, ignoring the possibility that unfilled vacancies may exist. Similarly, we refer to the November-to-November change in workplace level employment as "job destruction" if this is negative and "job creation" if it is positive.

An employee who is observed at workplace A in November of year t but who was observed at workplace B in November of $t-1$ is counted as a hire in A and as a separation in B. Since we cannot identify jobs, we are unable to distinguish a replacement hire from a hire to a newly created position. We also cannot distinguish between separations which are initiated by employers (layoffs) or employees (quits).

We compute rates of job and worker flows for the whole economy, for the private sector only, and for each one-digit industry. Rates of flows for these aggregates are calculated by first

² Note that this does not mean that the data set covers all employment relationships. Two types of employment relationships are not included: (1) short relationships which start and broken up between the November counts, and (2) secondary jobs. Together these make up on average 4.8 per cent of all manyears of employment.

³ We consider for each worker, the November workplace attachment from which she earned the most during a given year. IDA registers up to 3 jobs for each worker in each year, but the employer-employees are matched with greatest confidence for the primary attachments. Hence we ignore multiple job holding.

summing over workplace-level flows between any two years t and $t-1$ and then dividing by aggregate employment in $t-1$.

3. Magnitude of aggregate job and worker flows

Figure 1 depicts the annual changes in total employment in Denmark over the period 1980 to 1995, both in absolute (left vertical axis) as well as relative (right vertical axis) terms.⁴ From 1984 to 1985 the number of employed persons increased by 85,000 or, in relative terms, by 4% from its 1984 level. This is the largest positive increase during the 16 year period. Indeed, Figure 1 shows that for most years the absolute value of the net change in employment is less than 2 per cent.

One of the main achievements of the descriptive literature on job and worker flows is to uncover that the net changes in total employment hide processes of job and worker reallocation of a much larger magnitude. Figure 2 makes it clear that Denmark is no exception in this respect. Indeed, given the modest net employment changes, the gross changes appear surprisingly large.

In this figure both worker- (hires and separations) and job-flows (job creation and job destruction) for the entire Danish economy are displayed as a fraction of total employment in the preceding year. We find that roughly 30 per cent of all employees are hires, i.e. they had not been with the same workplace the year before. Separations are at a similar level.

⁴ Relative change in employment from $t-1$ to t is computed as the ratio of the absolute change in employment from $t-1$ to t and total employment in $t-1$.

The high level of worker flows is due to a number of institutional factors. First, the costs to employers for laying off their workers are low owing to no mandatory severance pay, no experience rating in the unemployment insurance system and weak job security for blue collar workers. Second, generous unemployment benefits are easily available to unemployment insurance fund members. Third, barriers to worker mobility are lowered by the fact that most social benefits, pensions and vacation pay are independent of the individual's employer.

Job creation, i.e. the sum of all November-to-November net employment changes of expanding and newly born workplaces, on average accounts for about 13 per cent of initial total employment, while job destruction fluctuates around 12 per cent. The average job and worker flows for the entire economy are slightly higher than those for the manufacturing sector presented by Albæk and Sørensen (1998). The difference is not due to the additional four years of data used in our paper is because non-manufacturing sectors are also included. The worker flows appear to be fairly high; even during the early nineties when unemployment was rising, hires were a little less than 30 per cent of the work force. This large scale reallocation of labour consumes substantial resources in the form of the adjustment and transaction costs borne by both workers and firms in their attempt to dissolve and form employee-employer matches.

Not surprisingly, economists have started to develop models designed to explain various features of this job and worker reallocation process, such as its cyclical properties or its individual realizations (hires, separations, job creation and destruction) at the workplace or firm level. See, for instance, Boeri (1996) for a survey of the theoretical research aimed at explaining the cyclical behavior of job reallocation.

Figure 2 showed that there are sizeable job and worker flows in Denmark throughout the entire observation period and at all stages of the business cycle. Next consider Figure 3 showing how individual series for manufacturing and the private sector differ from the economy as a whole. The two upper panes of figure 3 show that private sector job creation and destruction both fluctuate around a level of about 14 per cent. This seems to be high compared to other countries, but such comparisons are problematic - not least because this is the first study based on an all-encompassing data set.

The manufacturing sector closely tracks the private sector series, albeit at a 2-3 percentage points lower level. The economy-wide series also lies below the private sector level. As we shall see below, this is mainly due to the below-average job turnover of Denmark's large public sector. Worker flows show a similar pattern: high levels of private sector hires and separations (about 32 per cent on average), with the manufacturing sector tracking the private sector pattern but 4-5 per cent below, and the economy-wide series in between. Hence, as for the magnitude of job and worker flows, "manucentrism" has produced an essentially accurate but somewhat understated impression of job and worker turnover in the private sector and the entire economy.

3.1. Sectoral differences

Taking advantage of the IDA database's comprehensive coverage we next address the question how the other one-digit sectors of the economy square with the level and pattern of job and worker flows in the entire economy. To put things in perspective, Table 1 gives the average share of each one-digit sector of total as well as of private sector employment.

Denmark has a large public sector that over the 1980 to 1995 period has employed on average 36 per cent of all workers. Manufacturing, trade and financial services are the biggest

industries in the private sector, with the former two employing roughly one third of all private sector employees. During the 15-year period, total employment has remained at the same level, and the same holds for most of the one-digit sectors in Table 1. The two exceptions are agriculture, which has declined, and financial services, in which employment has been growing.

Workplaces within the same sector presumably organize production in similar ways, compete in similar product and factor markets and are thus subject to the same sector-specific shocks. Yet, one-digit sectors form a crude classification, at least for workplaces in the larger industries.

An indicator of this broad within industry variety is the number of subsectors that belong to each one-digit level in Statistics Denmark's four-digit sectoral classification⁵ (see column 3 of table 1). On that scale, one-digit manufacturing workplaces make up a very diverse group, as they are classified into 36 subgroups at the four-digit level. The results of Davis and Haltiwanger's (1992) study of U.S. manufacturing workplaces suggests that there is a great amount of heterogeneity in job flows even among workplaces that belong to the same narrowly defined (four-digit) US sector. Nevertheless, we view the one-digit industry breakdown as crude but transparent and useful, since between-industry differences in the conditions in which workplaces operate are likely to be much greater than within-industry differences.

Figure 4 shows how hiring in each one-digit industry differs from the economy-wide average (which is drawn as a dotted line in each plot). Compared to the entire economy, the

⁵ Statistics Denmark's four-digit sectoral grouping (111 realisations) closely corresponds to NACE, the European Community's standard four-digit classification scheme. NACE, in turn, is based on ISIC, Rev.3.

construction sector and especially the agricultural sector generally show high hiring rates. In agriculture, newly hired employees account for 40 per cent of the initial workforce in any given year while the series for construction shows a strong cyclical amplitude⁶. Hires in the trade, transport and (financial) services sectors are generally at or somewhat above the economy average. Manufacturing, the public sector and especially utilities (electricity, gas and water) have below average rates of hiring.

This ranking (high flows for agriculture and construction; low flows for the utilities; slightly below-average flows for the public sector and manufacturing; average or slightly above average flows for trade, financial services and transport) is roughly maintained when we consider job creation, job destruction and separations. This can be seen from the average flows (averaged over all years from 1980 to 1995) in Table 2, as well as from Figures A1 through A3 in the appendix, which depict graphs analogous to Figure 4 for job creation (Figure A1), job destruction (Figure A2) and separations (Figure A3).

During the period 1980-95 on average 43 per cent of hiring was due to job creation and 41 per cent of separations due to job destruction. For the manufacturing sector the corresponding shares were both 42 per cent. The shares were lower in the public sector – 35 per cent – and close to average in the trade and transport sectors. In the remaining sectors the shares were on average close to 50 per cent.

We conclude that with the exception of the utilities (and to a some degree also the public sector), there are substantial levels of job and worker flows in all one-digit sectors of the economy. While there are differences in the job and worker flow rates among the larger

⁶ These movements are not due to seasonality as we consider annual, November-to-November changes.

sectors, they are small in comparison to the differences between the larger and the smaller sectors. At one end of the spectrum are the low-turnover utilities whose production technology and product demand neither allows nor demands rapid adjustment of the work force. At the other end are the highly volatile construction and agriculture sectors.

3.2. Differences by workplace size

The IDA database also allows for a breakdown of worker- and job-flows by workplace size. The small business sector is often considered as the source of most job growth in popular discussions and, consequently, receives for example a preferred tax treatment by policy makers. Davis et. al. (1996), however, find no support for this view in their study of U.S. manufacturing workplaces. Rather, they demonstrate that some of the facts pervading the public discussion on small business job creation performance are upward biased due to classifying workplaces into size groups according to base year employment. This is because changes in the level of employment tend to regress to a workplace's long-run size: an increase in employment is usually (partially) reversed by a decline in employment in the next period, and vice versa.⁷

In order to mitigate the regression-to-the-mean bias, we follow Davis et. al. (1996) in using a workplace's average employment in consecutive years to allocate it to a size group. We have done this in two alternative ways. Firstly, by averaging over two adjacent years, and secondly, by computing the average size for all observations on the workplace. We have deliberately chosen not to use the same size groups as Davis et.al. because our data set has a much higher fraction of small workplaces. Columns 4 and 5 of Table 3 reveal that, on average, over 90 per

⁷ Hence, under base-year- employment classification, the same workplace is likely to be classified as a small workplace prior to an expansion of its work force but as a large(r) workplace prior to a contraction. As a result, small workplaces get the (undeserved) "fame" for creating jobs while large workplaces get the "blame" for destroying jobs.

cent of all Danish workplaces have 20 employees or less and account for 30 per cent of employment (columns 2 and 3). In comparison, in Davis et. al.'s sample of U.S. manufacturing workplaces, the same size group's share of (manufacturing) employment is below 5 per cent.

Table 4 gives job and worker flows (averaged over the 1980 to 1995 period) by size group, for the entire economy. Rates of gross job flows are strongly decreasing in workplace size. However, small workplaces have both high rates of job creation *and* destruction, leading to small (but generally positive) rates of net job creation.

The negative relationship between workplace size and the level of job flows also carries over to worker flows. Smaller workplaces have clearly higher rates of worker flows than large workplaces. For workplaces with more than 40 employees, the workplace size – hires/separations gradient seems quite flat. Averaging over all years in computing the plant size leads to a somewhat flatter flows-size relationship than using two-year averages. The differences are not large, however.

If we consider each size group's share of job and worker flows a similar picture emerges. Table 5 shows that small workplaces play the dominant role in the job and worker reallocation process in Denmark, and they have a considerably higher share of all jobs and worker flows. About 50 per cent of all job flows created or destroyed are accounted for by workplaces with at most 20 employees. Workplaces in this size group also do 36-41 per cent of all hiring or separating. At the other end of the size spectrum, workplaces with more than 500 employees account for 8-16 per cent of the job and worker reallocation. The findings regarding the role of small workplaces are even more pronounced if we consider the private

sector only: as can be seen from Table A2 in the appendix 44 per cent of hires and separations in the private sector occur in small workplaces.

The higher rates of job and worker flows in small workplaces explain why flow rates in manufacturing were found to be below the private sector and economy averages: small businesses are underrepresented in manufacturing. Twenty per cent of manufacturing workplaces have less than 20 employees whereas the corresponding shares for for instance agriculture, construction, trade and services are 80, 53, 56 and 42 per cent, respectively. In manufacturing, most workplaces employ between 100 and 500 employees while only 40 per cent of all manufacturing workplaces are in the smallest size groups (compared to more than 60 per cent for both the economy and the private sector).

We have also calculated equivalents of Table 4 that break down rates of job and worker flows by size group, conditional on one-digit industry. The results, which to save space are not shown here, indicate considerable homogeneity of the job flow rates between workplaces in a given size class, regardless of their industry. On the contrary, worker flow rates tend to be homogenous between workplaces within industry, regardless of size class.

4. Cyclicity of job and worker flows

Boeri (1996) reviews several macroeconomic models that have been developed to account for the stylized facts of job flow cyclicity: job destruction is countercyclical, job creation is procyclical and their sum, labeled job reallocation, is countercyclical. A stylized version of the argument usually made to explain countercyclical job reallocation runs like this: jobs are easy to destroy but hard to create and, hence, job destruction fluctuates more over the cycle than job creation, thereby determining the cyclical properties of job reallocation. However,

Boeri (1996) argues that (a) these facts have exclusively been found in US manufacturing data which (b) underrepresents the small business sector.

The relevant Danish evidence is Albæk and Sørensen's (1998) study based on a sample of all Danish manufacturing workplaces from 1980 to 1991. They find that job destruction is counter-cyclical, job creation procyclical, but job reallocation is acyclical as the cyclical variations of job creation and destruction in Danish manufacturing cancel each other out. Thus, their results suggest that the counter-cyclicity of job reallocation cannot be considered as a stylized fact. Albæk and Sørensen also provide information of the cyclical behavior of worker flows in Danish manufacturing. They find that hires are procyclical, separations are counter-cyclical but that -- unlike job turnover -- procyclical hires dominate counter-cyclical separations over the cycle.

In Table 6 we set out the Spearman rank correlations⁸ (marginal p-values in parentheses) of job and worker flows with the percentage change in real gross domestic product (Δ GDP) as our business cycle measure. We find for the *entire economy* that counter-cyclical job destruction dominates acyclical job creation, making their sum counter-cyclical. Job creation in the *private sector* is, however, unlike the total economy, quite strongly procyclical and as a consequence, job reallocation is acyclical.

The next two rows show the corresponding correlations for two one-digit sectors: manufacturing and the public sector. As for *manufacturing*, we find, contrary to Albæk and Sørensen (1998), a strong counter-cyclical variation in job destruction which dominates procyclical job creation to the extent that job reallocation as in the U.S. literature is counter-

⁸ We have also computed Pearson correlations, obtaining very similar results.

cyclical.⁹ As the cyclicity of job creation differed considerably between the total economy and the private sector it is of some interest to note that this is due to a relatively strong counter-cyclicity of *public sector* job creation. Thus, the evidence that job reallocation is counter-cyclical, seems rather fragile¹⁰, and this supports Boeri's (1996) caution against interpreting evidence from U.S. manufacturing as a "stylized fact".

Regarding worker flows, Albæk and Sørensen's finding of asymmetric worker flows is confirmed. Hires appear to be procyclical, whilst separations are only weakly (negatively) correlated with the business cycle. Clearly the latter is consistent with highly procyclical quits and highly counter-cyclical lay-offs. For the whole economy, however, worker flows are symmetric. Disaggregating the data shows firstly, that for the private sector as a whole worker flows are asymmetric, and secondly, that this holds true for most non-manufacturing industries within the private sector as well. Public sector hiring is negatively correlated with the business cycle which may explain why there is a big difference in the procyclicality in hires between the private sector and the total economy.

5. Conclusions

Based on data on all workplaces of the Danish economy from 1980 to 1995, we have considered the magnitude, cyclicity and heterogeneity of job and worker flows. A distinguishing feature of the data analysed in the previous sections is the very substantial amount of reallocation of jobs and workers. High levels of job and worker flows are observed in almost all sectors of the economy during all phases of the business cycle.

⁹ The difference with respect to Albæk and Sørensen may be due to two reasons. First, the period in our analysis is longer (1980-95, whereas there is 1980-91), and second, we have corrected for the problem of erroneously many plants in the data in 1987 mentioned in footnote 5 in their paper, whereas they merely deleted the problematic observations.

At the lower end of the spectrum is the utilities industry with its stable product demand and restricted competition. At the other end is agriculture and construction. For the remaining industries there is a ranking of the job and worker flow rates according to the share of small workplaces in each sector. Manufacturing, which has been the focus of the previous literature, has relatively few small workplaces and consequently smaller flows than trade, services or transports. Thus, manufacturing data understate private sector flow levels.

Jobs and worker flows are considerably larger in small workplaces than in the larger ones. For workplaces with more than 40 employees the flow-size gradient is rather flat, however. The role of small workplaces is more important outside manufacturing. Thus, using data from manufacturing as a "proxy" for the whole economy or the services sector, underestimates the importance of small workplaces in the jobs and worker reallocation processes.

As Davis and Haltiwanger's (1992) manufacturing study, which has inspired recent theoretical models of the business cycle, we too find that countercyclical job destruction dominates procyclical job creation in the manufacturing and for the whole economy.¹¹ However, the evidence is less conclusive if we consider the private sector, in which there is a much weaker negative, in fact insignificant, correlation between job reallocation and the business cycle. In the public sector job creation is counter-cyclical and job reallocation is acyclical. Thus, it is not obvious that counter-cyclical job reallocation is the "stylized fact" or the key feature of

¹⁰ We have also computed the cyclical correlations for the other one-digit sectors. They are both negative and positive and in the main, lower than in manufacturing.

¹¹ In their recent survey of the jobs and worker flows literature, Davis and Haltiwanger (1998) carefully point out that the evidence surveyed refers to the US and emphasize which parts of this pertains to the manufacturing sector only.

the economy¹² that much of the recent work in the field of macroeconomic theory have tried to explain.

¹² As was pointed out in section 3, the Danish labour market is relatively unregulated, especially compared many other European countries. Therefore, it might very well be that results for other countries with higher barriers to worker mobility or higher employment adjustment costs would differ even more from the US evidence.

Appendix

Figures A1-A3

Tables A1-A2

References

Abowd, J.M., Corbel, P., Kramarz, F., 1996. The Entry and Exit of Workers and the Growth of Employment: An Analysis of French Workplaces, NBER Working Paper 5551, National Bureau of Economic Research, Cambridge (MA), USA.

Albæk, K., Sørensen, B.E., 1998. Worker and Job Flows in Danish Manufacturing, 1980-1991, *The Economic Journal* 108, 1750-1771.

Anderson, P.M., Meyer, B.D., 1994. The Extent and Consequences of Job Turnover, *Brookings Papers on Economic Activity: Microeconomics*, 177-248.

Boeri, T., 1996. Is Job Turnover Countercyclical, *Journal of Labor Economics* 14, 603-625.

Davis, S. J., Haltiwanger, J., 1992. Gross Job Creation, Gross Job Destruction and Employment Reallocation, *Quarterly Journal of Economics* 107, 819-863.

Davis, S. J., Haltiwanger, J., 1998. Measuring Gross Workers and Job Flows. In: J. Haltiwanger, M. E. Mansner and R. Topel (eds.), *Labor Statistics Measurement Issues*. Chicago; University of Chicago Press, 77-119

Davis, S.J., Haltiwanger, J., Schuh, S., 1996. *Job Creation and Destruction*, Cambridge, MA: The MIT Press.

Foote, C.L., 1998. Trend Employment Growth and the Bunching of Job Creation and Destruction, *Quarterly Journal of Economics* 113, 809-834

Hammermesh, D.S., Hassink, W., Van Ours, J., 1996. Job Turnover and Labor Turnover: A Taxonomy of Employment Dynamics, *Annales d'Economie et de Statistique* 41-42, 1-40.

Hammermesh, D.S., 1998. The Art of Labormetrics, forthcoming in *Handbook of Econometrics* Vol.5, J. Heckman and E. Leamer (eds.), Amsterdam: North Holland.

Mortensen, D.T., Pissarides, C.A., 1998. Job Reallocation, Employment Fluctuations, and Unemployment Differences, forthcoming in *Handbook of Macroeconomics*, M. Woodford and J. Taylor (eds.), Amsterdam: North Holland.

Table 1: Average employment share and number of four-digit subsectors of each one-digit sector

Sector	Share of total employment	Share of private sector	Number of four-digit subsectors
Agriculture, fishing and quarrying	0.02	0.04	7
Manufacturing	0.21	0.33	36
Electricity, gas and water supply	0.01	0.01	4
Construction	0.06	0.10	7
Trade (wholesale,retail, hotels, restaurants)	0.17	0.27	20
Transport, storage and communication	0.06	0.10	7
Services (financial, business activities,etc.)	0.10	0.16	15
Public services	0.36	-	15

Table 2: Average annual job and worker flows

Average flows from 1980-1995 by one-digit sector					
	Creation	Destruction	Net	Hires	Separations
Agriculture	0.219	0.223	-0.004	0.453	0.457
Construction	0.179	0.179	-0.001	0.356	0.355
Trade	0.155	0.150	0.005	0.357	0.351
Financial services	0.151	0.138	0.013	0.310	0.297
Transport	0.139	0.135	0.004	0.309	0.305
Manufacturing	0.117	0.117	0	0.276	0.276
Public services	0.099	0.093	0.007	0.281	0.268
Utilities	0.078	0.065	0.013	0.159	0.146
Economy	0.124	0.117	0.007	0.294	0.288
Private	0.144	0.140	0.004	0.319	0.315

Table 3: Workers and workplaces by workplace size class, 1980-1995 (percentage shares)*

a. Workplace size based on two-year averages

Size class	Employment share		Workplace share	
	Economy	Private sector	Economy	Private sector
1 – 9	0.187	0.238	79.15	81.98
10 – 20	0.138	0.154	11.44	10.31
21 – 40	0.121	0.136	4.85	4.39
41 – 100	0.171	0.154	3.13	2.31
101 – 500	0.220	0.200	1.26	0.93
501 – 1000	0.068	0.054	0.11	0.07
> 1000	0.095	0.060	0.06	0.03

b. Workplace size based on all observations

Size class	Employment share		Workplace share	
	Economy	Private sector	Economy	Private sector
1 – 9	0.167	0.270	74.73	77.56
10 – 20	0.142	0.189	14.00	12.94
21 – 40	0.124	0.165	5.86	5.38
41 – 100	0.174	0.190	3.69	2.84
101 – 500	0.227	0.246	1.53	1.15
501 – 1000	0.068	0.065	0.13	0.09
> 1000	0.099	0.080	0.07	0.04

* To allocate workplaces into size groups we used two different methods; in a: the average of two adjacent years, and in b: the average over all years the workplace is present in the data set. In both cases, the averages are weighted with the size of the workplace relative to total employment in the size group.

Table 4: Average job and worker flow rates by size group – the whole economy*
a. Workplace size based on two-year averages

Size group	Job flows			Worker flows	
	Creation	Destruction	Net	Hires	Separations
1 – 9	0.249	0.237	0.013	0.415	0.402
10 – 20	0.135	0.124	0.011	0.330	0.318
21 - 40	0.121	0.111	0.010	0.304	0.294
41 - 100	0.102	0.092	0.009	0.270	0.260
101 - 500	0.092	0.090	0.003	0.270	0.267
501 - 1000	0.070	0.072	-0.002	0.253	0.255
> 1000	0.055	0.058	-0.003	0.232	0.235

b. Workplace size based on all observations

Size group	Job flows			Worker flows	
	Creation	Destruction	Net	Hires	Separations
1 – 9	0.177	0.172	0.005	0.393	0.386
10 – 20	0.123	0.109	0.014	0.337	0.321
21 - 40	0.108	0.098	0.010	0.310	0.298
41 - 100	0.093	0.085	0.009	0.274	0.265
101 - 500	0.085	0.082	0.003	0.276	0.272
501 - 1000	0.076	0.073	-0.002	0.266	0.263
> 1000	0.062	0.066	-0.004	0.246	0.251

* See footnote to Table 3.

Table 5 : Share of size group in economy-wide job and worker flows*

a. Workplace size based on two-year averages

Size class	Job flows		Worker flows	
	Creation	Destruction	Hires	Separations
1 – 9	0.365	0.366	0.255	0.253
10 – 20	0.147	0.142	0.149	0.148
21 – 40	0.115	0.112	0.121	0.120
41 – 100	0.136	0.131	0.152	0.150
101 – 500	0.158	0.163	0.194	0.197
501 – 1000	0.037	0.041	0.056	0.058
> 1000	0.041	0.046	0.072	0.075

b. Workplace size based on all observations

Size class	Job flows		Worker flows	
	Creation	Destruction	Hires	Separations
1 – 9	0.291	0.298	0.216	0.217
10 – 20	0.159	0.150	0.157	0.153
21 – 40	0.123	0.118	0.126	0.124
41 – 100	0.147	0.141	0.157	0.155
101 – 500	0.178	0.181	0.206	0.208
501 – 1000	0.047	0.049	0.059	0.060
> 1000	0.056	0.063	0.080	0.084

*. See footnote to Table 3.

Table 6: Cyclical correlations of job and worker flows for selected sectors*

	Job creation	Job destruction	Job reallocation	Hires	Separations
Economy	0.27 (0.33)	-0.83 (<0.01)	-0.79 (<0.01)	0.39 (0.15)	-0.40 (0.14)
Private sector	0.61 (0.02)	-0.82 (<0.01)	-0.38 (0.17)	0.60 (0.02)	-0.38 (0.17)
Manufacturing	0.48 (0.13)	-0.74 (<0.01)	-0.37 (<0.01)	0.55 (0.02)	-0.32 (0.13)
Public sector	-0.54 (0.05)	-0.26 (0.17)	-0.64 (0.38)	-0.15 (0.46)	0.12 (0.70)

*. Numbers in parantheses are p-values. The bold numbers are correlations, which differ significantly from zero at the 10 per cent level.

Table A1: Average job and worker flow rates by size group - the private sector***a. Workplace size based on two-year averages**

Size group	Job flows			Worker flows	
	Creation	Destruction	Net	Hires	Separations
1 – 9	0.252	0.248	0.005	0.422	0.417
10 – 20	0.142	0.134	0.008	0.336	0.328
21 - 40	0.125	0.116	0.009	0.311	0.302
41 - 100	0.118	0.109	0.009	0.300	0.291
101 - 500	0.098	0.095	0.003	0.266	0.263
501 - 1000	0.068	0.080	-0.012	0.224	0.236
> 1000	0.054	0.068	-0.014	0.192	0.206

b. Workplace size based on all observations

Size group	Job flows			Worker flows	
	Creation	Destruction	Net	Hires	Separations
1 – 9	0.180	0.179	0.001	0.318	0.317
10 – 20	0.127	0.117	0.010	0.289	0.280
21 - 40	0.112	0.105	0.008	0.267	0.260
41 - 100	0.105	0.098	0.007	0.258	0.250
101 - 500	0.093	0.090	0.002	0.233	0.231
501 - 1000	0.082	0.081	0.00	0.214	0.212
> 1000	0.059	0.077	-0.018	0.169	0.187

*. See footnote to Table 3.

Table A2: Share of size group in private sector job and worker flows*

a. Workplace size based on two-year averages

Size group	Job flows		Worker flows	
	Creation	Destruction	Hires	Separations
1 – 9	0.417	0.421	0.315	0.316
10 – 20	0.152	0.147	0.162	0.160
21 – 40	0.117	0.112	0.132	0.130
41 – 100	0.126	0.120	0.146	0.143
101 – 500	0.139	0.139	0.170	0.170
501 – 1000	0.026	0.032	0.039	0.041
> 1000	0.023	0.029	0.037	0.040

b. Workplace size based on all observations

Size group	Job flows		Worker flows	
	Creation	Destruction	Hires	Separations
1 – 9	0.338	0.345	0.270	0.272
10 – 20	0.166	0.159	0.172	0.168
21 – 40	0.129	0.124	0.139	0.137
41 – 100	0.139	0.133	0.153	0.151
101 – 500	0.159	0.159	0.180	0.181
501 – 1000	0.037	0.037	0.043	0.044
> 1000	0.033	0.044	0.043	0.048

*. See footnote to Table 3.

Figure 1: Net change in employment

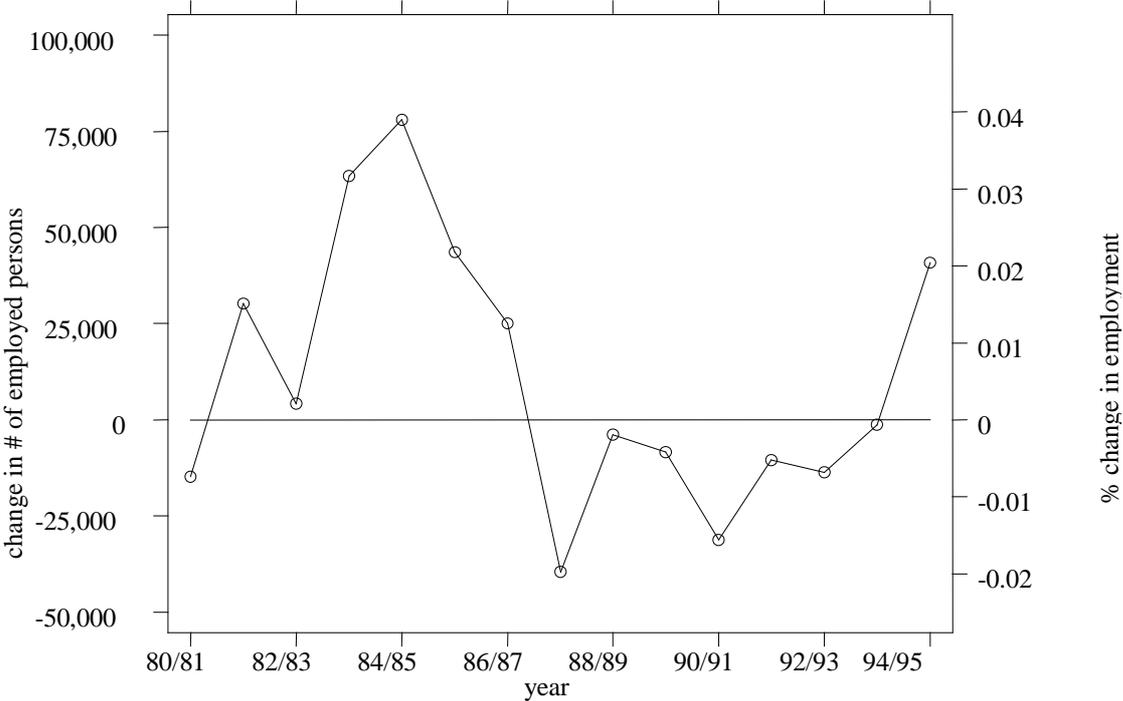


Figure 2: Job flows (Job creation / job destruction) and worker flows (hires / separations) for the Danish economy, 1980-1995

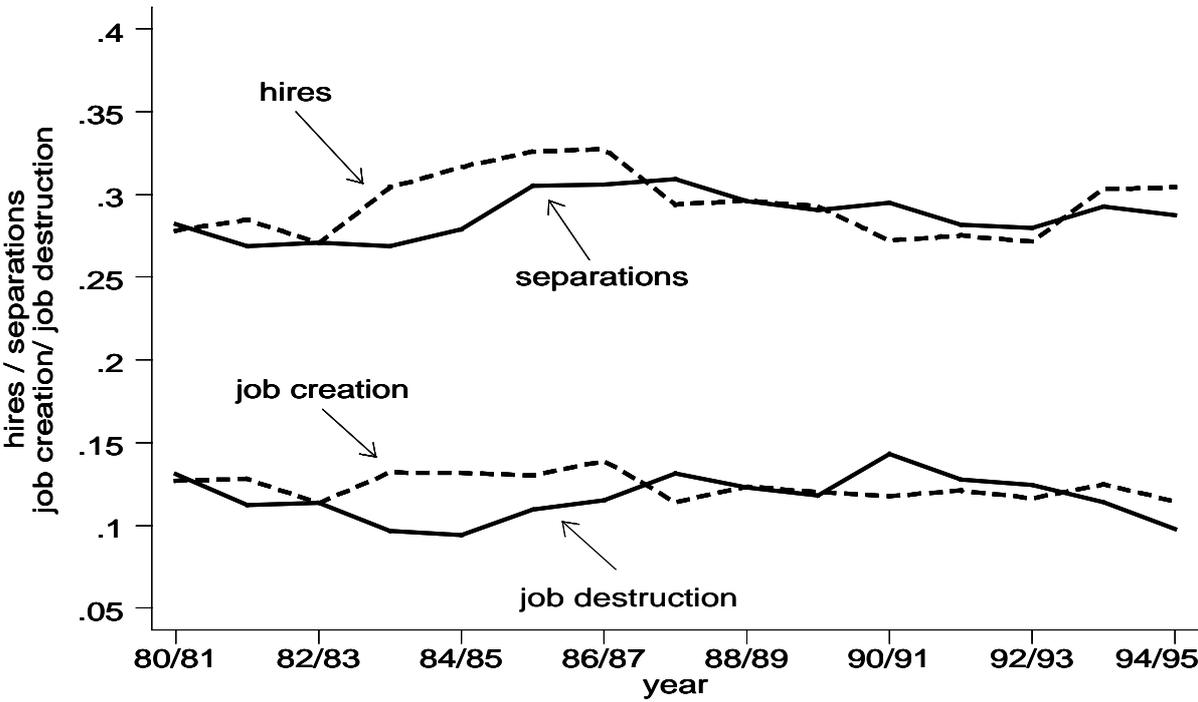


Figure 3: job and worker flows - manufacturing vs. private sector & economy

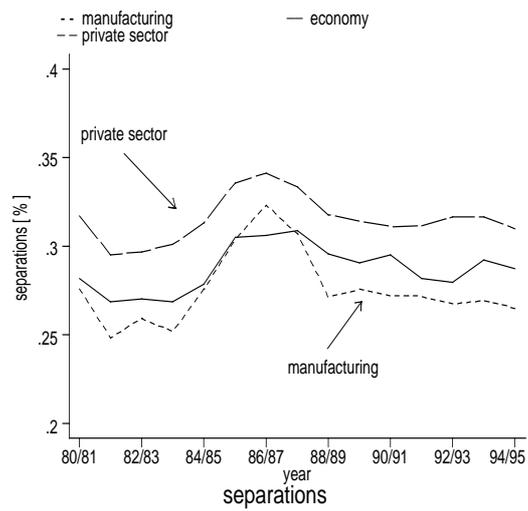
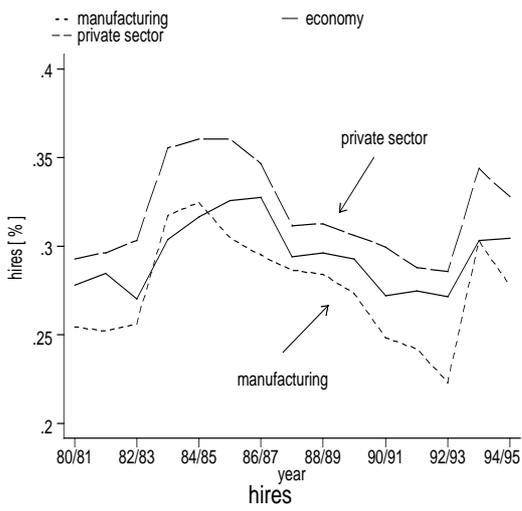
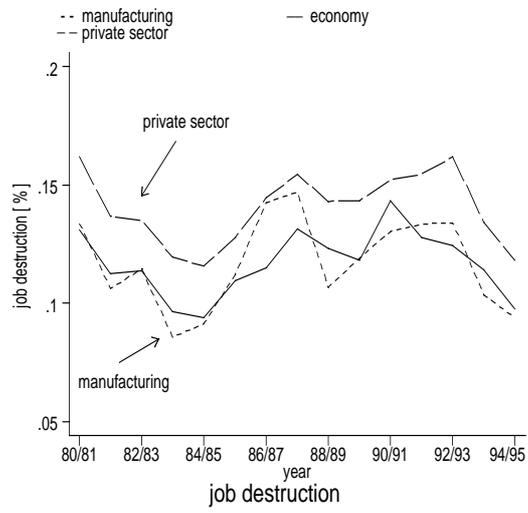
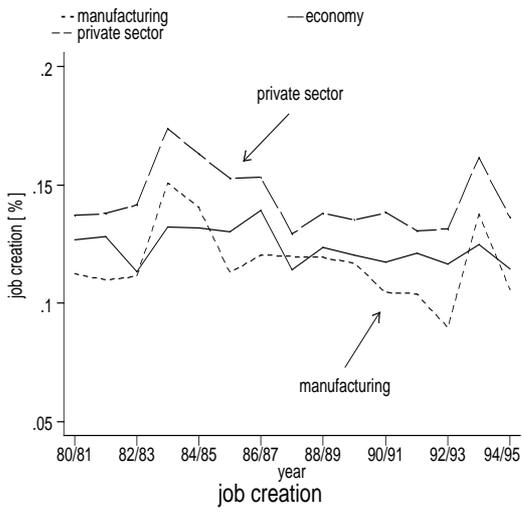


Figure 4: Hires - economy vs. one-digit sectors

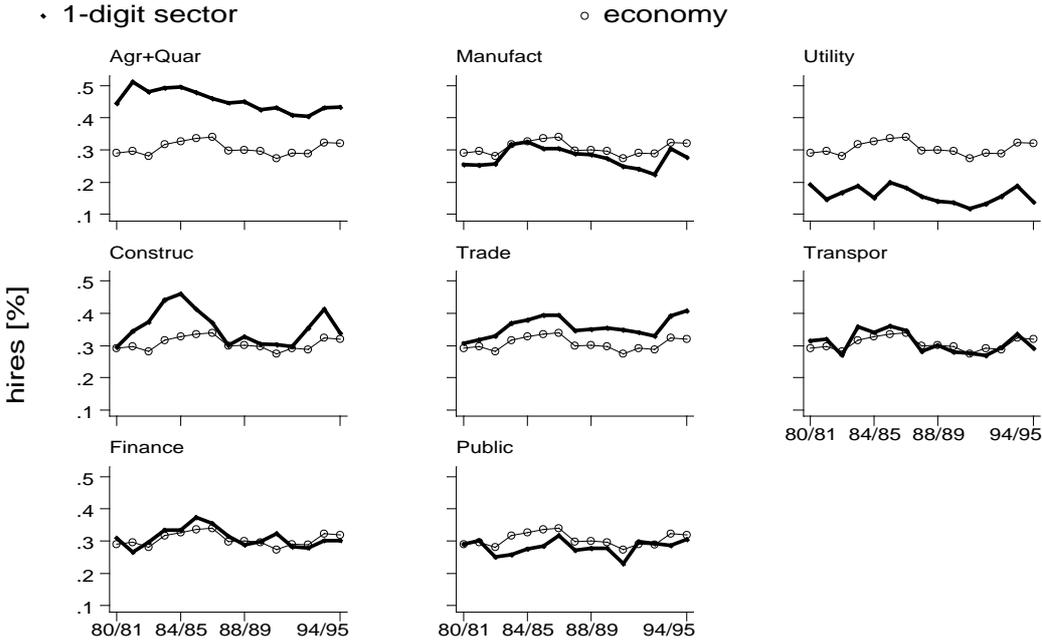


Figure A1: Job creation- economy vs. other one-digit sectors

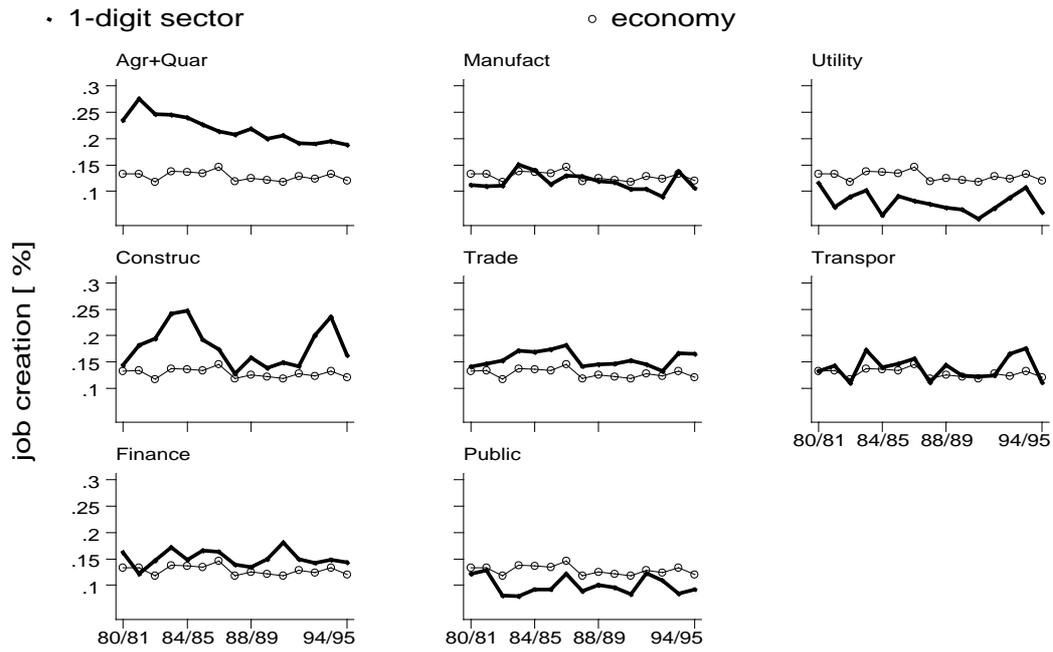


Figure A2: Job destruction - economy vs. other one-digit sectors

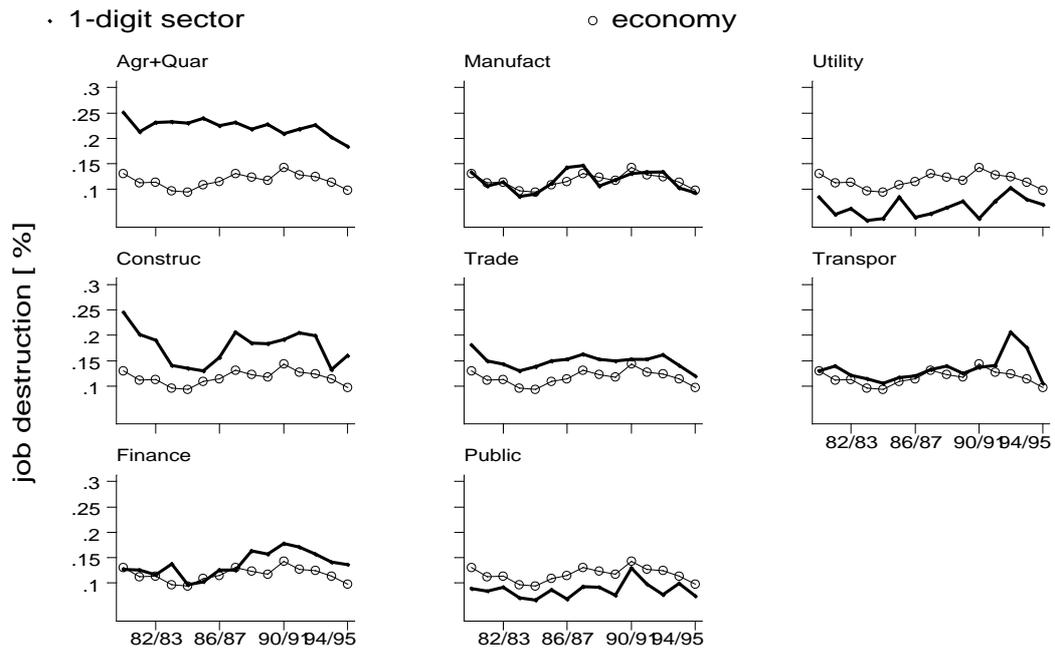


Figure A3: Separations - economy vs. other one-digit sectors

