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THE TURNOVER OF JOBS AND WORKERS IN A DEEP RECESSION: EVIDENCE FROM THE FINNISH BUSINESS SECTOR***

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ABSTRACT: Job and worker flows in the Finnish business sector are studied during a deep recession in the early 1990s. The data set, Employment Statistics, covers effectively the whole work force. The gross job and worker flow rates are fairly high. Much of the adjustment of labor input has happened through a reduced hiring rate rather than through an increased separation rate. However, during the recession the group of declining plants included more and larger plants than before, which led to reduced employment. Excess worker turnover (churning) and excess job reallocation have dropped during the recession. There is no strong evidence of the countercyclicality of job reallocation. The flows are calculated both for the whole business sector, and for seven main industries. Services have clearly higher flow rates than manufacturing, but the cyclical changes in the flows are fairly similar in all industries. To test the sensitivity of the results to data sources, job flows are calculated also using Business Register and Industrial Statistics.

Theme: Labor markets

Keywords: job creation, job destruction, hiring, separation, churning, job reallocation

JEL Classification numbers: J23, J63

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TIIVISTELMÄ: Tutkimuksessa tarkastellaan työpaikka- ja työntekijävirtoja Suomen yritys-sektorilla 1990-luvun alun syvän laman aikana. Aineistona käytetään työssäkäyntitilaston yksilöaineistoa, joka kattaa käytännössä ko. sektorin koko työvoiman. Työpaikkojen ja työn-tekijöiden bruttovirrat ovat suuria. Suuri osa työpanoksen sopeutuksesta on tapahtunut alentuneen työntekijöiden sisäänvirtausasteen kautta eikä niinkään nousseen ulos-virtausasteen kautta. Toisaalta laman aikana supistuvien toimipaikkojen ryhmään kuului enemmän ja suurempia toimipaikkoja, mikä johti työllisyyden alenemiseen. Työntekijöiden ylimääräinen vaihtuvuus (kirnuaminen) ja työpaikkojen ylimääräinen uudelleenallokaatio ovat alentuneet laman aikana. Tulokset eivät anna vahvaa tukea hypoteesille työpaikkojen uudelleenallokaation vastasyklisyydestä. Virrat on laskettu koko yrityssektorille ja seitsemälle päätoimialalle. Palvelualoilla virtojen asteet ovat selvästi korkeammat kuin teollisuudessa, mutta niiden suhdannevaihtelu on melko samanlaista kaikilla toimialoilla. Aineston vaikutuksia tuloksiin tutkitaan laskemalla työpaikkavirrat myös yritysrekisterin toimipaikka-aineistosta ja teollisuustilastosta.

1 INTRODUCTION

The research on job flows has expanded rapidly in the 1990s. This has been hastened by increased availability of large firm or plant data sets. Estimates of job turnover rates are now available for most industrial countries and for many developing countries and transition economies as well (see Davis and Haltiwanger, 1999, for a summary of job turnover rates in various countries). Also several theoretical models have been developed to explain the behavior of gross job flows (e.g. Mortensen and Pissarides, 1994, Caballero and Hammour, 1994).

This research has left several open questions. The literature shows that the measurement of the flows is very sensitive to the properties of the data. These data issues include definitions of firm births and deaths, use of firms vs. establishments as the basic unit, lower limits to plant or firm size, etc. Since the solutions adopted to these issues vary greatly across countries, international comparisons are difficult and have to be treated with caution. It is easier to examine industries over time or to make comparisons across industries within one country.

The research on job turnover has also been criticized of "manucentrism" (Hamermesh, 2000), since the stylized facts, like the countercyclicality of job turnover, have mainly been based on the US manufacturing data. This tendency has been affected by the easier availability of data on manufacturing plants. Obviously, there is need for further research on the service sector.

A central issue in the research has been the alleged countercyclicality of job turnover, which has inspired much theoretical research attempting to explain it (see Schuh and Triest, 1998, for recent empirical evidence from the US). On the other hand, some researchers have questioned the existence of the phenomenon, especially in Europe (e.g., Boeri, 1996). Obviously, more information is needed on different countries and industries, and different cyclical conditions.

So far the research on worker flows has been much scarcer than that on job turnover. Sometimes worker flows have been calculated from data which are separate from the plant data that have been used for the job reallocation calculations (e.g., Davis, Haltiwanger, and Schuh, 1996). Therefore the worker flows are not always directly comparable to the job flow data. The need for linked data sets that include information both on firms and on employees has been emphasized. The examination of worker flows together with the job flows gives more information on the dynamics of the labor market.

We examine job and worker flows with Finnish data during a period of very volatile cyclical conditions (see Figure 1). The end of the 1980s was a period of rapid growth and overheating in the Finnish economy. In the beginning of the 1990s this was followed by a very deep recession, with GDP declining 7 percent in 1991 and the decline continuing in 1992 and 1993. The unemployment rate rose rapidly in a few years from 3 to 17 percent, reaching its peak in 1994. With the economic recovery GDP started to increase again in 1994 and the unemployment rate started to drop slowly. Behind the recession there was a combination of external and internal shocks. The collapse of Soviet Union led to a decrease in Finnish exports and at the same time there was a slowdown in the economies of Western Europe. The demand shock was accompanied by a severe banking crisis, caused by the deregulation of financial markets and a rapid growth of credit supply. There were big changes in enterprise structures, as the number of bankruptcies and firm exits soared.

There has also been drastic deindustrialization. The number of jobs in manufacturing decreased from 500 000 in the mid-1980s to 350 000 in the deepest phase of the recession. The Finnish case therefore offers an ideal opportunity to examine the behavior of the job and worker flows during a very sharp recession and rapid structural change[1].

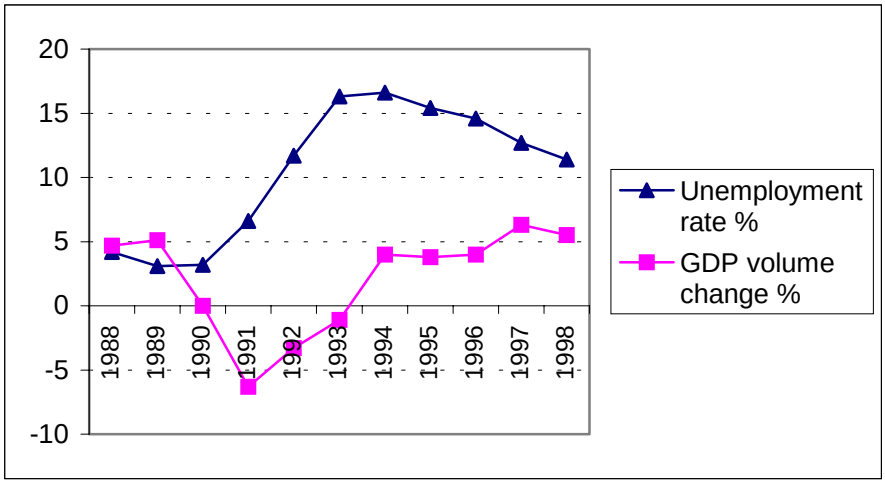

Figure 1: Unemployment rate and GDP change

We attempt to shed light on the following issues with Finnish data: 1) What kind of cyclical changes happen in the job and worker flows? Are the changes in worker turnover different from changes in job turnover over the business cycle? What happens to "excessive" turnover? Calculation of job and worker flows from the same data in a consistent manner helps to answer these questions. The Finnish registers on individuals, firms, and plants form a large linked data base, which offers good opportunities for this kind of research.

2) How sensitive are the flows to definitions and data sources? We attempt to study this by calculating the flows from separate sources of data, Employment Statistics (ES), Business Register (BR), and Industrial Statistics (IS). The first source allows the calculation of both job and worker turnover, and the latter two can be used for alternative measures of job turnover. ES and BR are available for the whole business sector, whereas IS covers only manufacturing.

3) Are there differences in the flows and their cyclicality between manufacturing and services? Besides the whole business sector, we examine seven main industries, manufacturing (including mining and energy); construction; wholesale and retail trade; hotels and restaurants; financial intermediation; and business services (real estate, renting and business activities).

4) What kind of flows appear in growing and declining plants, and what is the role of entering and exiting plants in different business cycle phases? These issues are studied by classifying the plants according to their growth.

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[1] See, e.g., Honkapohja and Koskela (1999) for a description of the recession in Finland. Ilmakunnas and Topi (1999) analyze the turnover of firms during the recession.

The structure of this paper is as follows. The data sources are described in Section 2 and the flow measures in Section 3. In Section 4 we present results on job and worker flows in the whole business sector, in Section 5 in main industries, and in Section 6 at the plant level. Section 7 concludes the paper.

2 DATA SOURCES

The research on job and worker flows together has used various kinds of data sets. In various countries, there are different kinds of registers or surveys of firms with information on hirings and separations, or individual-based data that can be aggregated to firm or plant level[2]. In the Nordic countries extensive administrative records cover effectively the whole population of employees and employers. They can be used for identifying the employment status for the calculation of job and worker flows[3]. We use this kind of extensive data for Finland. In addition, we use data on plants to obtain an alternative measure of gross job flows.

The **Employment Statistics** (ES) database compiles information on the economic activity of individuals and their background characteristics from a large number of different administrative registers. It covers effectively the whole population of Finland. There are over 2 million employees in this register. In the business sector (defined here to include the seven industries mentioned in the introduction) there are more than 1.1 million employees in about 100 000 plants. The enterprise and plant identification codes, industry and other general information needed in ES are taken as such from Business Register (BR). The employer-employee links on which our linked data rest are determined in the ES system. For each person a unique plant appearing in BR is determined as his/her primary employer during the last week of each year. This is the source of information for employment, inflow and outflow of workers. In order to have consistent job and worker flow series we have dropped the persons that are not linked to a plant that appears in BR. We use the ES data from the period 1987-1997.

When the job and worker flows are analyzed, we need to combine information from different statistics using plant codes. Because of various data problems, including inconsistencies in the coding systems in the various statistics, the matching of workers and plants is never complete. We discuss the linking of various registers in more detail in Ilmakunnas, Maliranta, and Vainiomäki (2000).

The **Business Register** data base of Statistics Finland covers registered employers and enterprises subject to VAT and their plants in Finland, and it is the basic source of enterprise and plant codes used in other Statistics Finland registers and statistics. There are over 200 000 business sector plants in the register. Identification codes for enterprises used in BR originate from tax authorities. BR gives identification codes for plants, in turn, when a new plant is established. BR also follows changes in the demographic structure of plants and

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[2] See, e.g., Abowd, Corbel, and Kramarz (1999), Hamermesh, Hassink, and van Ours (1996), Anderson and Meyer (1994), and Burgess, Lane, and Stevens (2000).

[3] See, e.g., Albæk and Sørensen (1998) and Bingley, Eriksson, Westergård-Nielsen, and Werwatz (1999) for Denmark, Persson (1999) for Sweden, Barth and Dale-Olsen (1997) and Salvanes (1999) for Norway, and Ilmakunnas and Maliranta (2000) for Finland.

enterprises like their death and changes in ownership. This is the source of information on an alternative measure of gross job flows. We use the BR data from the years 1988-1998.

The **Industrial Statistics** (IS) compiles comprehensive information on the economic activity of industrial plants by annual surveys. When a plant in BR fulfills certain selection criteria, it is picked up into the information system of IS. Up to the year 1994 the main criterion was that the plant employed at least five persons, but since then the sample has been smaller. IS is our source for an alternative measure of job flow for the manufacturing plants. The employment figures in IS represent average employment during the year. The full IS database includes about 7 000-8 000 plants annually, but in our analysis we concentrate on active production plants (omitting, e.g., headquarters and auxiliary units), so our basic plant data include approximately 6 000 plants annually. In this study we use the plant data from the years 1987-97.

There are several reasons why the job flows or net employment change calculated from the three statistical sources may be different. First, the definitions of plants may be different. Secondly, the coverage is different. IS includes only plants that have employment over a given size limit, whereas ES and BR also include smaller plants. Thirdly, the time periods differ. ES has information on employment relationships at the end of the year, whereas BR and IS measure average employment over the year.

Earlier research with Finnish data has used only some of the above sources, has not covered both the recessionary period and the recovery following it, and has not examined both job and worker flows. Romppanen (1974) used the IS data for the years 1961-1970, OECD (1994) reports results based on the BR data for 1986-1991, Vainiomäki and Laaksonen (1999) use the IS data for 1987-93, and Laaksonen and Teikari (1999) for 1990-1994.

3 FLOW MEASURES

Job creation is defined as the sum of positive employment changes in plants. The corresponding job creation rate is obtained by dividing this figure by the average number of employees, $JC_t = 100*\Sigma_i \Delta E_{it}^{+}/((E_{it}+E_{i,t-1})/2)$, where E_{it} denotes employment in plant *i* in year *t* and the superscript "+" refers to positive changes. The job destruction rate is defined as the sum of absolute values of negative employment changes, divided by the average number of employees, $JD_t = 100*\Sigma_i |\Delta E_{it}^{-}| /((E_{it}+E_{i,t-1})/2)$; "-" refers to negative changes. The net rate of change of employment or job flow rate is the difference of these values, $NET_t = JC_t - JD_t$. The sum of job creation and destruction rates is the gross job reallocation rate, also called the job turnover rate or absolute job flow rate, $JR_t = JC_t + JD_t$, and the difference of the job reallocation rate and the absolute value of net change is the excess job reallocation rate, $EJR_t = JR_t - |NET_t|$. The excess job reallocation rate can further be decomposed to EJR between sectors and EJR within sectors: $EJR = \Sigma_s W_s(|NET_s| - |NET|) + \Sigma_s W_s(JR_s - |NET_s|)$, where W_s is employment share of sector *s*, and NET_s and JR_s are calculated separately for each sector. Following Davis et al. (1996), all the flows are divided by the average of period *t* and *t-1* employment. Because of this scaling, all gross flow rates can in principle vary in the interval [0, 200 %] and the net change in the interval [-200 %, 200 %].

The ES data makes it possible to decompose plant level employment changes to worker flows. It is possible to identify the workplace of the employees at the end of each year. We have counted the number of those employees in year *t* who were employed in the same plant in year *t-1*; they are called stayers. Comparison of the plant-level employment figures and the number of stayers gives information on the worker flows to the plant and from it. The number of employees who have entered plant *i* during year *t*, and are still working there at the end of the year, is H_{it}. The sum of these employees over all plants is a discrete measure of worker inflow, or hiring. On the other hand, the number of employees who were working in plant *i* in year *t-1*, but are no longer working there at the end of year *t*, is S_{it}. The sum of these employees over all plants is a discrete measure of worker outflow, or separation. However, short spells of employment within the year cannot be observed. Although our data therefore do not enable us to calculate worker flows continuously, the advantage of these discretely measured flows is that they are comparable to the discretely measured gross job flows.

Dividing worker inflow and outflow in period t by the average employment, we obtain the worker inflow rate or hiring rate $WIF_t = 100*\Sigma_i H_{it}/((E_{it}+E_{i,t-1})/2)$ and the worker outflow rate or separation rate $WOF_t = 100*\Sigma_i S_{it}/((E_{it}+E_{i,t-1})/2)$, respectively. Their difference is the net rate of change of employment, $NET_t = WIF_t - WOF_t$, and their sum is the worker flow rate or worker turnover rate, $WF_t = WIF_t + WOF_t$. The difference of the worker turnover and job turnover rates is the churning flow rate or excessive worker turnover rate, $CF_t = WF_t - JR_t$ (Burgess, Lane, and Stevens, 2000). Because only end of the year employment status is observed, 200 % is the upper limit for all the worker flows. If shorter employment spells were observed, the worker flow rates could exceed 200 %.

The difference between worker turnover and job turnover is that the latter measures the total change (increase or decrease) in vacancies, whereas the former measures also hiring and separation in existing positions. Churning measures excessive worker turnover that is not needed to achieve a given job turnover and excessive job reallocation measures job turnover that is not needed to achieve a given net employment change. According to the definitions, $WF = JR + CF = |NET| + EJR + CF$, so that the inequality $WF \geq JR \geq |NET|$ holds.

4 FLOWS IN THE BUSINESS SECTOR

The advantage of the ES data, compared to other sources of data, is that it is possible to examine both job and worker flows at the same time in a consistent manner, i.e. NET = WIF - WOF = JC - JD. In Figure 2 we present the WIF, WOF, JC, JD, and NET figures from the ES data (see also Table 1). At the end of the 1980s both inflow and outflow rates were clearly above 30 %. When the recession started, worker outflow WOF slightly increased and inflow WIF clearly dropped. It seems that most of the adjustment in the labor input has been made by decreasing the inflow rate rather than by increasing the outflow rate. After the deepest phase of the recession was over, the inflow has again increased. The outflow rate started to drop already after the year 1991, when employment decreased the most. This is most likely an indication of less voluntary outflow (quits) in a period of tightened labor markets, although our data do not allow us to separate quits and layoffs. The result that firms have reacted to the recession by decreasing the hiring rate rather than by

increasing the separation rate is very robust. The strong procyclicality of the inflow rate WIF is shown by the positive correlation of WIF and NET, which is in the whole period 1988-97 as high as 0.78 (see Table 3 below). The countercyclicality of WOF is slightly less clear; the correlation of WOF and NET is -0.51. The same result can be observed from the time series of different industries, from the cross section distribution of manufacturing industries, and at the plant level (see below and Ilmakunnas and Maliranta, 2000).

The result is consistent with studies of quit rates. For example, Akerlof, Rose and Yellen (1988) report that quits are strongly procyclical, but layoffs do not have a strong steady-state relationship to cycles (measured by unemployment rate); total separations are therefore procyclical. They explain this with a vacancy chain model (see also Contini and Revelli, 1997). In a recovery, more opportunities to job switches open up, leading to a chain of vacancies and further job-to-job quits. Also Picot, Lin, and Pyper (1998) present evidence of strongly procyclical hiring and less variable permanent separations; the latter is a result of procyclical quits and countercyclical permanent layoffs. Burda and Wyploz (1994) conclude that employment inflows are procyclical, but employment outflows less so. Although flows to unemployment are countercyclical, employment to employment and employment to non-employment flows are strongly procyclical. Also this result is consistent with our findings that the inflow rate varies more than the outflow rate over the business cycle.

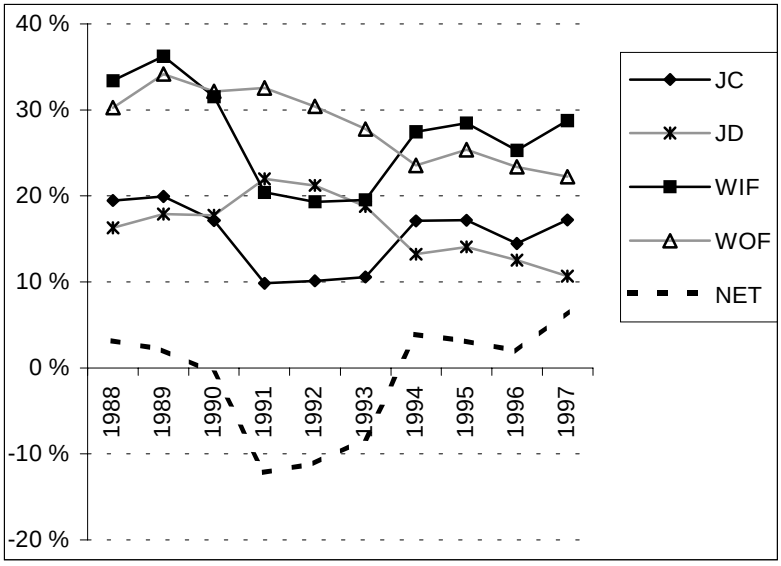

Figure 2: Gross job and worker flows, business sector

Corresponding cyclical changes have happened in the job flows. The job creation rate JC decreased and the job destruction rate JD increased when the recession started, especially in 1991. Already in 1994 the gross job flow rates had returned to a more normal level. There is a downward trend in both worker and job flows, which is not completely hidden by the cyclical changes. This can to some extent be related to data problems that may be more serious in the beginning of the period. (See the discussion below in Section 5.) Both gross job flow series are very cyclical in a symmetric fashion. The correlation of JC and NET is 0.89 and the correlation of JD and NET is –0.89 (see Table 3 below).

The possible countercyclicality of job reallocation JR has received special attention in the literature. This holds if job destruction JD varies over the business cycle more than job creation JC, since Cov(JR,NET) = Cov(JC+JD,JC-JD) = Var(JC) – Var(JD). Some theoretical explanations of this phenomenon are based on entry and exit. In the model of Caballero and Hammour (1994), low productivity plants exit in recession and their jobs are destroyed. In recovery, the effects of start-up costs on entry slow job creation down. In the model of Mortensen and Pissarides (1994) firms have one worker and the job can be vacant or filled. Job creation happens fast, but hiring takes time. Both models lead to asymmetry of job creation and destruction and countercyclical job reallocation. Mortensen (1994) has extended the model to included search on-the-job, combining countercyclical job reallocation and procyclical quits.

In our case, job turnover JR does not, according to Figure 3, follow any clear pattern in the business cycle. The correlation of JR and NET in the period 1988-97 is only 0.02. According to the BR data (Table 2), job reallocation behaves more closely according to the countercyclicality hypothesis, although the turnover was highest at the end of the recession and during the recovery period. This could, of course, be the result of the lagged influences of the recession. In the period 1989-97, the correlation of job reallocation JR and NET is in the BR data –0.15, which is not significantly different from zero (see Table 4). All in all, the evidence from the Finnish business sector does not give very strong support to the hypothesis of countercyclical job reallocation. This clearly results from the symmetry of job creation and destruction. The result that reallocation is not countercyclical has been found also in some other countries (see Boeri, 1996).

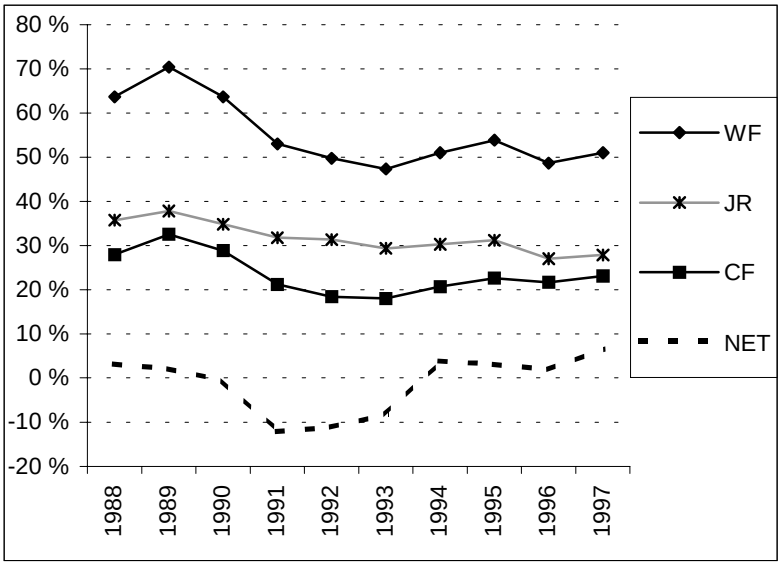

Figure 3: Worker and job turnover, business sector

The symmetry of job creation and destruction, coupled with most likely strongly procyclical quits, helps to explain the behavior of the worker flows. In a recession, the combination of strongly decreased quits and relatively smaller increase in the job destruction rate leads to an only slightly increased worker outflow rate. On the other hand, decreased job creation is reinforced by reduced quits and therefore also reduced replacement hiring, thereby leading to a large drop in inflows. Note that this conclusion is different from that of Blan-

chard and Diamond (1990). They concluded that larger fluctuation in job destruction than in job creation in the US leads to larger fluctuation in worker outflow than in inflow[4].

Although the cyclicality of job reallocation has been the issue often studied, it has been argued that excess job reallocation EJR is a better measure of the ongoing reallocation process (e.g. Davis, 1998). Our results show that EJR is procyclical in all of the data sets that we have used (although the correlation of EJR and NET is not significant in all cases). This shows that differences in the employment behavior of plants have become smaller in the recession of the 1990's and there has been less excessive reallocation of jobs between plants. Another issue raised in the debate on countercyclical job reallocation is the timing of reallocation. Over the business cycle, job destruction increases in a recession and decreases in a recovery, but these changes need not be symmetric. Caballero and Hammour (1999) define as "turbulence" a phenomenon where cumulative job destruction over the business cycle is positive and as "chill" the situation where cumulative job destruction is negative. Since our data is too short to examine the effects with impulse responses, we have to rely on simple calculations. We take the period 1990-1997 as a full recession-recovery cycle. The year 1990 is treated as a "normal" year in terms of the level of the flows. In that year the job creation and destruction rates were roughly equal and the economy was in that sense in a steady state. Each year, the changes in job destruction and job creation from the base year 1990 are calculated. Finally, these figures are cumulated and divided by the average of 1989 and 1990 employment to obtain measures of the cumulative rates of change in JD and JC. Figure 4 shows these cumulative changes in the Finnish business sector, calculated both from the Employment Statistics and Business Register data.

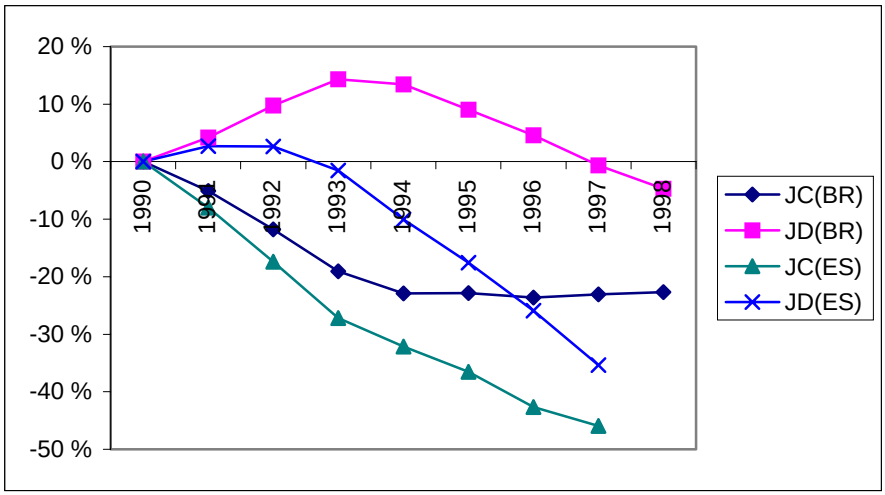

Figure 4: Cumulative changes in gross job flows, % of 1990 employment, Employment Statistics (ES) and Business Register (BR)

In the ES data, the cumulative change in job destruction is at first positive, but turns negative already in 1993. This may be interpreted as a sign of "chill"; the decline in job de-

[4] They considered flows to and from unemployment and did not consider employment-to-employment flows.

struction during the recovery has been so large that it outweighs the increase during the recession. The development of the cumulative change in job creation is fairly dramatic: it has declined for most of the period and is strongly negative. The increase in job creation during the recovery has not been sufficient to compensate for the loss of jobs in the recession. This development of job creation may be one reason for the negative cumulative change in job destruction. When job creation falls or does not grow much, it "insulates" some of the existing plants from the pressure for job destruction (cf. Caballero and Hammour, 1994). In the BR data the cumulative change in job destruction turns negative in 1997 and hence the chill effect is less clear.

Figure 3 shows clearly that the recession caused a fall in the worker turnover rate WF when employment fell, and when employment recovered, WF started to increase again. It therefore seems to be procyclical, although the correlation of WF and NET, 0.30, is not significant (see Table 3). In the recovery, worker turnover WF grows compared to job turnover JR, and in the recession their ratio declines. As a result, the churning rate CF varies procyclically, i.e. excess worker turnover declines when the labor market situation tightens (see Figure 5, where WF is decomposed to WF = |NET| + EJR + CF, and Table 1). In 1988-90 churning accounted for 45 % of the worker flow WF (CF/WF=0.45), but the corresponding figure was 38 % during the recession years 1991-93, and 43 % in the recovery years 1994-97. These changes are most likely caused by less voluntary separation during the recession. Also the excess job reallocation rate EJR declined during the recession. In other words, during an upturn in the economy, there is a lot of turnover in the work force, but during a downturn the labor market becomes more rigid and excessive turnover of workers and jobs declines. The correlations of CF and NET and EJR and NET are, however, not quite significant at the 5 % level (see Table 3).

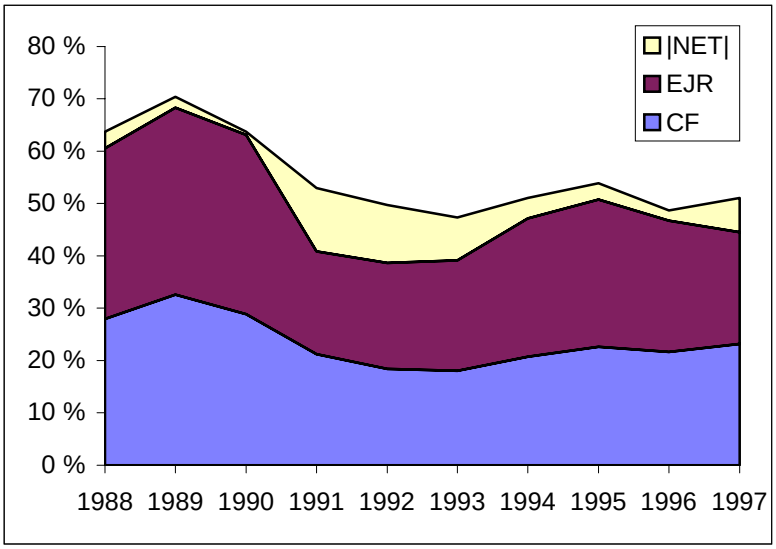

Figure 5: Decomposition of worker flow, business sector

5 FLOWS IN MAIN INDUSTRIES

Table 1 presents average job and worker flows in the main sectors, calculated from the ES data for three different periods[5]. We examine the boom in the late 1980s (1988-90), recession (1991-93) and recovery (1994-97). Table 2 shows the average job flows, calculated from the BR plant data, using the same periods with the exception of the first one, which covers the years 1989-90. A comparison of the tables reveals that the ES data give clearly higher job flow rates than the BR data at the end of the 1980s, but the flows are fairly identical from the early 1990s onwards. A possible explanation for this observed difference between the data sources is that during the first years after ES was initiated, persons could not be linked to the right plants as accurately as in the later years. Because of this, the plant employment figures can vary from year to year, which shows up as upward biased job flows in the beginning of our time series.

In manufacturing (including mining and energy) the flow rates are slightly lower than in the whole business sector. This reflects the fairly high flow rates in services and construction. Differences in the type of activity and institutions may explain the differences in worker and job flow rates. In manufacturing, the cyclical changes are very similar to those in the whole business sector: during the recession, the inflow rate WIF, churning CF, and excess job turnover EJR clearly declined. In the lower part of Table 2 the gross job flows for manufacturing are presented also from the plant data of IS. The level of the flows is even lower than in the BR data, which is probably explained by the fact that the smallest plants are not included in IS[6]. The cyclicality of the flows in manufacturing is, however, very similar.

In construction, the net employment change declined by 30 % annually during the recession. Still, the average job creation rate JC was 11 % in 1991-1993. The high outflow rate WOF shows that during the years of the deepest recession over half of the employees in the branch left their jobs. In trade, both job and worker flows are higher than in manufacturing, which is most likely related to a higher share of temporary jobs and smaller plant size in this sector. The outflow rate WOF hardly increased in wholesale and retail trade during the recession, whereas the drop in the inflow rate WIF dominated the change in employment. The cyclical changes in the hotels and restaurants sector show more clearly a simultaneous increase in outflow WOF and drop in inflow WIF. Although the churning rate CF has dropped in hotels and restaurants, it has still been higher than in the other main sectors. In transportation and business services the turnover of workers and jobs is fairly high. The cyclical picture of these branches is fairly similar to that of the whole business sector. In financial intermediation the flows are dominated by a big structural change in banking. The worker inflow rate WIF has increased after the recession years, but also the outflow rate WOF has risen. Still, at the end of the 1980s the financial sector had lower job and worker turnover than manufacturing; the branch had long employment relationships. However, when the sector was reorganized after the banking crisis, in 1994-97 the worker turnover rate WF exceeded that of manufacturing.

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[5] In each year EJR = JR - |NET| by definition. This needs not hold for averages of the flows over time, since the average of NET figures does not equal the average of |NET| figures.

[6] Until 1994 IS mainly includes plants with at least 5 employees. In the years 1995-97 the sample is smaller and includes only continuing plants.

Employment Statistics									
Manufacturing (C,D,E)									
Period	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*
1988-90	28.7	28.5	57.2	16.2	16.0	32.1	25.0	31.8	0.2
1991-93	16.2	24.8	40.9	8.2	16.8	25.0	16.0	16.4	-8.6
1994-97	21.7	18.2	39.9	12.7	9.2	21.8	18.1	18.3	3.5
Construction (F)									
Period	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*
1988-90	42.1	40.8	82.9	22.1	20.8	43.0	39.9	35.5	1.3
1991-93	23.3	53.5	76.8	11.0	41.1	52.1	24.7	21.9	-30.2
1994-97	44.4	33.5	77.9	31.0	20.1	51.1	26.8	40.2	10.8
Wholesale and retail trade (G)									
Period	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*
1988-90	35.6	34.3	69.9	20.1	18.8	39.0	30.9	37.7	1.3
1991-93	21.9	32.2	54.0	12.0	22.3	34.3	19.7	24.0	-10.3
1994-97	26.9	24.2	51.0	15.8	13.1	28.8	22.2	25.5	2.7
Hotels and restaurants (H)									
Period	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*
1988-90	43.1	41.6	84.8	20.9	19.4	40.4	44.4	36.4	1.5
1991-93	29.8	43.1	72.9	14.2	27.5	41.8	31.1	28.4	-13.3
1994-97	38.8	36.6	75.3	20.4	18.2	38.6	36.7	36.0	2.2
Transport, storage and communication (I)									
Period	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*
1988-90	33.5	32.6	66.1	20.7	19.8	40.5	25.7	37.9	0.9
1991-93	18.2	25.0	43.2	9.8	16.6	26.5	16.7	19.7	-6.8
1994-97	28.6	25.4	54.0	17.7	14.5	32.2	21.8	29.0	3.2
Financial intermediation (J)									
Period	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*
1988-90	26.0	23.8	49.8	13.4	11.2	24.6	25.2	22.0	2.2
1991-93	15.8	22.8	38.6	6.5	13.6	20.0	18.5	13.0	-7.1
1994-97	20.5	24.3	44.8	10.7	14.5	25.2	19.5	21.4	-3.8
Real estate, renting and business activities (K)									
Period	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*
1988-90	42.4	34.2	76.7	24.0	15.8	39.9	36.8	31.7	8.2
1991-93	26.4	35.0	61.4	14.2	22.8	37.0	24.4	28.4	-8.6
1994-97	37.6	29.5	67.1	23.1	15.0	38.1	29.0	30.1	8.1
***Business sector** (C-K)*									
Period	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*
1988-90	33.7	32.2	65.9	18.8	17.3	36.1	29.8	34.2	1.5
1991-93	19.8	30.3	50.0	10.2	20.7	30.8	19.2	20.3	-10.5
1994-97	27.5	23.6	51.1	16.5	12.6	29.1	22.0	25.2	3.9

Table 1: Worker and job flows in main sectors, Employment Statistics data

Business Register					
Manufacturing (C,D,E)					
Period	*JC*	*JD*	*JR*	*EJR*	*NET*
1989-90	9.3	11.2	20.5	18.6	-1.8
1991-93	6.8	15.7	22.5	13.6	-8.8
1994-97	11.3	9.1	20.4	18.2	2.2
Construction (F)					
Period	*JC*	*JD*	*JR*	*EJR*	*NET*
1989-90	17.2	14.7	31.8	28.9	2.5
1991-93	10.0	31.0	41.1	20.1	-21.0
1994-97	25.7	19.9	45.6	38.5	5.7
Wholesale and retail trade (G)					
Period	*JC*	*JD*	*JR*	*EJR*	*NET*
1989-90	14.3	12.8	27.1	25.5	1.4
1991-93	11.4	21.2	32.6	22.7	-9.8
1994-97	14.6	14.1	28.7	24.7	0.5
Hotels and restaurants (H)					
Period	*JC*	*JD*	*JR*	*EJR*	*NET*
1989-90	15.2	13.7	28.9	27.4	1.5
1991-93	11.2	23.5	34.7	22.5	-12.2
1994-97	17.4	15.2	32.7	27.3	2.2
Transport, storage and communication (I)					
Period	*JC*	*JD*	*JR*	*EJR*	*NET*
1989-90	22.3	20.3	42.6	40.7	2.0
1991-93	10.4	16.1	26.5	20.8	-5.8
1994-97	19.4	14.0	33.5	28.1	5.4
Financial intermediation (J)					
Period	*JC*	*JD*	*JR*	*EJR*	*NET*
1989-90	7.3	6.7	14.0	11.6	0.6
1991-93	5.9	12.8	18.7	11.8	-6.9
1994-97	12.0	17.0	29.0	23.6	-5.0
Real estate, renting and business activities (K)					
Period	*JC*	*JD*	*JR*	*EJR*	*NET*
1989-90	19.3	12.8	32.1	25.6	6.5
1991-93	15.8	21.8	37.5	31.5	-6.0
1994-97	24.7	16.0	40.7	32.0	8.7
***Business sector** (C-K)*					
Period	*JC*	*JD*	*JR*	*EJR*	*NET*
1989-90	13.6	12.9	26.5	25.7	0.8
1991-93	9.5	19.1	28.7	19.1	-9.6
1994-97	15.9	13.0	28.9	25.8	2.9
Industrial Statistics					
Manufacturing (C,D,E)					
Period	*JC*	*JD*	*JR*	*EJR*	*NET*
1988-90	6.9	9.5	16.4	13.9	-2.5
1991-93	5.6	13.3	18.9	11.2	-7.7
1994-97	7.7	6.1	13.7	12.2	1.6

Table 2: Job flows in main sectors, Business Register and Industrial Statistics data

FLOW	*Manu-facturing*	*Construc-tion*	*Wholesale and retail trade*	*Hotels and restaurants*	*Transport, storage & communi-cation*	*Financial intermedi-ation*	*Real estate, renting & business activities*	***Business sector***
WIF	**0.60**	**0.95**	**0.67**	**0.91**	**0.55**	**0.61**	**0.95**	**0.78**
WOF	-0.52	**-0.94**	-0.46	**-0.67**	-0.14	0.10	**-0.63**	-0.51
WF	0.07	0.23	0.19	0.53	0.25	0.37	**0.73**	0.30
JC	**0.71**	**0.93**	**0.75**	**0.98**	0.51	**0.83**	**0.99**	**0.89**
JD	**-0.79**	**-0.94**	**-0.86**	**-0.99**	-0.38	**-0.67**	**-0.98**	**-0.89**
JR	-0.14	-0.13	-0.25	**-0.62**	0.09	0.27	**0.69**	0.02
CF	0.32	0.36	0.54	**0.74**	0.54	0.34	**0.66**	0.48
EJR	0.25	**0.69**	0.31	**0.79**	0.15	0.38	0.33	0.54

Note: The correlations that are significant at 5% level (two-sided test) are printed in bold.

Table 3: Correlation of flows with NET, Employment Statistics data (1988-97)

	BR data								**IS data**
FLOW	*Manu-facturing*	*Construc-tion*	*Wholesale and retail trade*	*Hotels and restaurants*	*Transport, storage & communi-cation*	*Financial intermedi-ation*	*Real estate, renting & business activities*	***Business sector***	*Manu-facturing*
JC	**0.95**	**0.81**	**0.82**	**0.93**	**0.76**	0.24	**0.86**	**0.95**	**0.87**
JD	**-0.97**	**-0.86**	**-0.97**	**-0.97**	-0.26	**-0.70**	**-0.80**	**-0.96**	**-0.99**
JR	-0.52	-0.16	**-0.82**	**-0.62**	0.41	-0.34	0.18	-0.15	**-0.90**
EJR	**0.64**	0.44	0.14	**0.67**	0.40	0.04	-0.03	**0.65**	0.14

Note: The correlations that are significant at 5% level (two-sided test) are printed in bold.

Table 4: Correlation of flows with NET, Business Register on plants (1989-97) and Industrial Statistics (1988-97)

Clear evidence of the countercyclicality of job reallocation JR is obtained from the ES data only for hotels and restaurants (see Table 3). In construction, job turnover has a low correlation with NET in the whole period, although during the recession the job destruction rate was extremely high. In manufacturing JR clearly does not vary cyclically. According to the BR data, on the other hand, JR is countercyclical in trade and hotels and restaurants (see Table 4). In manufacturing, the correlation of JR and NET is –0.52, which is not quite significant at the 5 % level. According to the IS data, JR is clearly countercyclical in manufacturing. Interestingly, we find stronger evidence for countercyclicality from the service industries, whereas in the US it has been argued that in the service industries job creation and destruction are more symmetric than in manufacturing (Schuh and Triest, 1998). If we measure the reallocation activity with EJR, the results clearly show procyclicality of reallocation in all data sets and almost all industries. Although some of the correlations of EJR and NET are not significant, there is only one negative correlation (-0.03 in the case of business services in the BR data). Excess job reallocation is most procyclical in hotels and restaurants.

Among the other flow rates, the inflow rate WIF is strongly procyclical in all sectors, whereas the correlations of the outflow rate WOF with NET are significant in only three sectors. The result supports the observation that the adjustment of labor input through the inflow rate is more important than that through the outflow rate. However, in construction WIF and WOF seem to vary fairly symmetrically in opposite directions over the cycle. Also the job creation rate JC and job destruction rate JD vary symmetrically in opposite directions. This explains the low correlations of job turnover JR with NET. The procyclicality of the churning rate CF is clearest in the services (hotels and restaurants and business services, and slightly less clearly in trade and transportation).

All in all, the results for the sectors show some clear regularities. The sectors that have high job creation, worker inflow, and job reallocation rates, also have high job destruction, worker outflow, and worker turnover rates, respectively. A large turnover of jobs and workers seem to be a permanent symptom of some sectors. Another feature of the results is that before the recession the job creation and destruction rates were fairly equal in most sectors. In this sense the sectors were close to a "steady state". In the recession all sectors experienced a drop in job creation and an increase in job destruction. In this sense the recession has clearly been an aggregate shock rather than a reallocation shock (cf. Baldwin, Dunne, and Haltiwanger, 1998). However, at a more disaggregate level it is possible to find industries that have experienced growth at the same time when most other industries have declined. In fact, if we decompose excess job reallocation in the business sector to EJR between the seven main sectors and EJR within the sectors, between sector EJR is very low and zero in some years. On the other hand, in manufacturing EJR between four-digit industries was approximately 20 % of total EJR in 1988-1994 (Ilmakunnas and Maliranta, 2000).

6 FLOWS AT THE PLANT LEVEL

We examine the flows at the plant level using the ES data. In Table 5 the plants are classified by the growth of employment. The first group includes exiting plants. For them the net employment change is $NET = 100*(-E_{it-1})/((0+E_{i,t-1})/2) = -200$ %. The second group is $-200\ \% < NET < -10\ \%$. They are called here "rapidly declining" plants. The third group is $-10\ \% \leq NET < -2\ \%$, "slowly declining" plants. The fourth group consists of plants with $-2\ \% \leq NET \leq 2\ \%$ and they are called "stable" plants. The fifth group of plants has $2\ \% < NET \leq 10\ \%$ and they are called "slowly growing" plants. The sixth group has $10\ \% < NET < 200\ \%$, i.e., "rapidly growing" plants. Finally, the seventh group includes entering plants. For them $NET = 100*E_{it}/((E_{it}+0)/2) = 200\ \%$.

The table shows the definitional connections of the job flows JC, JD, JR, EJR, and NET. In growing plants, JD = 0, and JC = JR, and in declining plants JC = 0 and JD = JR. EJR is different from zero only in the group of stable plants ($-2\% \leq NET \leq +2\%$), which includes slightly growing plants, slightly shrinking plants, and plants whose size has not changed.

Period	*Growth*	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*	*WNET*	*W*
1988-90	NET=-2	0	200	200	0	200	200	0	0	-200	-4.9	2
1988-90	-2<NET<-0.1	14.6	58.4	73.0	0	43.9	43.9	29.1	0	-43.9	-11.6	27
1988-90	-0.1≤NET<-0.02	14.6	20.4	35.0	0	5.9	5.9	29.2	0	-5.9	-0.8	14
1988-90	-0.02≤NET≤0.02	17.1	17.1	34.2	0.2	0.2	0.4	33.8	0.4	0.0	0.0	16
1988-90	0.02<NET≤0.1	22.6	16.9	39.5	5.7	0	5.7	33.8	0	5.7	0.7	13
1988-90	0.1<NET<2	58.4	17.0	75.4	41.4	0	41.4	34.1	0	41.4	10.1	25
1988-90	NET=2	200	0	200	200	0	200	0	0	200	8.0	4
Period	*Growth*	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*	*WNET*	*W*
1991-93	NET=-2	0	200	200	0	200	200	0	0	-200	-5.6	3
1991-93	-2<NET<-0.1	9.0	48.6	57.6	0	39.6	39.6	17.9	0	-39.6	-13.9	35
1991-93	-0.1≤NET<-0.02	7.9	13.8	21.6	0	5.9	5.9	15.7	0	-5.9	-1.1	19
1991-93	-0.02≤NET≤0.02	11.0	11.1	22.2	0.2	0.2	0.4	21.8	0.3	-0.1	0.0	18
1991-93	0.02<NET≤0.1	17.1	11.5	28.7	5.6	0	5.6	23.0	0	5.6	0.5	9
1991-93	0.1<NET<2	51.8	13.8	65.5	38.0	0	38.0	27.5	0	38.0	5.6	15
1991-93	NET=2	200	0	200	200	0	200	0	0	200	4.0	2
Period	*Growth*	*WIF*	*WOF*	*WF*	*JC*	*JD*	*JR*	*CF*	*EJR*	*NET*	*WNET*	*W*
1994-97	NET=-2	0	200	200	0	200	200	0	0	-200	-4.7	2
1994-97	-2<NET<-0.1	11.6	50.6	62.2	0	39.0	39.0	23.2	0	-39.0	-7.2	19
1994-97	-0.1≤NET<-0.02	10.7	16.3	27.0	0	5.6	5.6	21.4	0	-5.6	-0.7	13
1994-97	-0.02≤NET≤0.02	11.9	11.9	23.9	0.2	0.2	0.4	23.4	0.4	0.0	0.0	20
1994-97	0.02<NET≤0.1	16.4	10.8	27.2	5.6	0	5.6	21.5	0	5.6	0.9	16
1994-97	0.1<NET<2	48.6	12.6	61.2	36.0	0	36.0	25.1	0	36.0	9.9	28
1994-97	NET=2	200	0	200	200	0	200	0	0	200	5.6	3

Table 5: Flows by plant net growth (%), business sector

The table also includes the average employment share of each group, W, and the employment share weighted net employment change, WNET[7]. Entering and exiting plants are typically small and account for only a few percent of the total business sector employment. Almost half of the employment is in those plants that are growing or declining fast. Naturally, the worker inflow rate increases and outflow rate decreases when we go from the declining to growing plants. However, there is hiring of new workers also in the group of rapidly declining plants and separation of workers in the group of rapidly growing plants. In 1991-93 the inflow rate WIF of the rapidly declining plants was 9 % and the outflow rate WOF of the rapidly growing plants was 13.8 %.

We can conclude from this table that during the recession the decline in employment was not related to an increased outflow rate of workers. Among those continuing plants that have declined the most, i.e. rapidly declining plants, the worker outflow rate WOF actually dropped during the recession in 1991-93. As a result, the net employment change of this group changed from 43.9 % in 1988-90 to 39.6 % in 1991-93. However, this group included more and/or larger plants, so that the weighted net employment change WNET was –13.9 % in 1991-93. The average employment share W of this group grew from 26 % to 35 %. The adjustment through the decreased inflow rate WIF can be seen most clearly among the rapidly growing plants that during the recession included less and/or smaller plants. The net employment change of this group fell from 41.5 % in 1988-90 to 38 % in 1991-93, but the weighted net change WNET fell to half of its previous value. The employment share of this group fell from 24.5 % to 14.8 %. During the recovery, the outflow rate of the rapidly declining group of plants increased again, but the employment share of the group

[7] In Table 5 W is not exactly equal to WNET/NET, since NET, W and WNET are averages of the annual figures.

was now only 18.5 %, so that the weighted change shows only a small decline. On the other hand, among the growing plants the inflow rate WIF continued to fall. This group, however, had now so many and/or large plants that irrespective of their lower inflow rate they had a big contribution to the employment change of the whole business sector. Among the rapidly growing plants the weighted net change WNET was almost 10 %.

The results from other plant-level studies of job and worker flows also show that the hiring rates of growing and declining plants differ from each other more than what their separation rates do (e.g., Abowd et al., 1999, Hamermesh et al., 1996).

The exiting plants have contributed roughly -5 % to the employment change of the business sector (WNET) in all business cycle phases. The contribution of the entering plants has varied more, from 8 % in 1988-90 to 4 % in the recession and 5.6 % in the recovery. The shares of exiting and entering plants of the total number of plants are, however, higher. In Ilmakunnas and Maliranta (2000) it is shown that during the recession years in manufacturing the share of exiting plants was 16 % of all plants and the share of entering plants was 10 %. In this connection we should warn about the influence of data problems on the results. We have considered an exited plant to be a plant that was in the register in year *t-1*, but no longer in year *t*. Besides true exit, there may be other reasons why a plant disappears from the registers, but plant data is much less problematic in this sense than firm data.

The churning rate CF is highest in growing plants. It was 34 % in the rapidly growing plants in the boom of the 1980s, but only 15 % in the slowly declining plants during the recession years. This is in accordance with the procyclicality of churning, which was observed from the aggregate time series above. The workforce of a plant is ”renewed” more often when the plant is growing. During the recovery years the differences in churning rates between the growth categories were small, and in growing plants churning was actually lower than in the recession. This may reflect the opening up of new job opportunities when the economy recovers, which leads to increased ”excessive” turnover in declining plants.

7 CONCLUSIONS

We have used three Finnish data sources: Employment Statistics (ES), Business Register (BR), and Industrial Statistics (IS). ES was used to calculate both gross job and worker flows for the business sector and main industries in a period of very volatile employment. The other two data sets were used for calculating gross job flows, BR for the business sector and main industries, and IS for manufacturing. Different data sources give slightly different results on the level and cyclicality of gross job flows. An examination of the properties and quality of the data is therefore essential in the analysis of flows in the labor market.

The job and worker flow rates are fairly high in Finland in comparison to other countries (e.g. Davis and Haltiwanger, 1999). Possible explanations for this are the deep recession and fairly fast structural change that the country has experienced. The high level of the flows itself is consistent with the argument by Bertola and Rogerson (1997) that in Euro-

pean labor markets inflexible wages, e.g. due to centralized wage setting, can produce high job flows even in the presence of possible inflexibilities in the labor market. On the other hand, the fact that churning, or excess worker turnover, has been high in Finland, shows that the labor market is fairly flexible. For example, high firing costs should decrease both worker inflow and outflow and bring the worker turnover rate down closer to the job turnover rate.

The level of the gross job and worker flows varies across main industries. They are lowest in manufacturing, whereas services and construction have high flow rates. However, the cyclical fluctuations in the business sector and in manufacturing seem fairly similar. It seems that the use of manufacturing to represent the whole business sector in the analysis of flows is not necessarily misleading, but still it hides important heterogeneity across the industries.

The job creation rate varies procyclically and the job destruction rate countercyclically, but fairly symmetrically. As a result, job turnover is more or less acyclical in the whole business sector and in manufacturing. In some service industries, countercyclical job reallocation can be observed. However, the BR and IS data give more support to the hypothesis of countercyclical job reallocation in manufacturing. All in all, the "stylized fact" of countercyclical reallocation does not seem to fit the Finnish facts well. This also implies that much of the theoretical work aimed at explaining the phenomenon is not relevant in this situation. One explanation for the symmetry of job creation and destruction is that the employment share of entering and exiting plants is fairly limited in Finland and does not vary much over the business cycle. It is also possible that labor hoarding or firing restrictions limit the increase in job destruction during recession. This is reflected in the separation rate that did not grow much during the recession.

If we use the excess job reallocation rate as the measure of the reallocation process, countercyclicality is even more strongly rejected. This result may be related to the type of the shock that Finland experienced. It was clearly an aggregate shock that affected most industries and firms in the same way. In this kind of situation only part of the reallocation is "excessive".

The worker inflow (hiring) rate varies strongly procyclically and the worker outflow (separation) rate countercyclically. Worker turnover is procyclical, since firms adjust to demand changes more by adjusting hiring than separation. This is most likely the result of decreasing quits during a recession, when there are less opportunities for job switches and the vacancy chains are short. On the other hand, firms postpone replacement hiring, since it is a cheaper way to reduce the workforce than layoffs. In the recession, the average outflow rate declined, but the group of declining plants had a higher employment share, i.e. it included more and/or larger plants, which led to a big decline in employment.

Inflow and outflow of workers happens both in growing and in declining plants. However, growing plants account for most of the inflow and shrinking plants for most of the outflow. Most of job and worker turnover happens through adjustments in existing plants. The groups of entering and exiting plants each cover only a few percent of employment, although their contribution to employment change has been somewhat larger.

Churning, or excess worker turnover, is procyclical. In a recession the labor market becomes more rigid and "excessive" turnover of jobs and workers falls. This reduced turnover has a negative influence on the chances of displaced workers to find new employment and may be an important contributing factor behind the rise in long-term unemployment.

This paper has presented some basic facts of job and worker turnover in the business sector, in main industries, and at the plant level. The rich data sources make it also possible to examine at the plant level how different characteristics of the plants and their employees influence the flows of workers. We report results on this in a separate paper. The data also allow us to decompose worker inflow by source and outflow by destination. The determinants of hiring from unemployment and separation to unemployment will be investigated in future work.

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