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Labour Institute for Economic Research

20 December 2002

PALKANSAAJIEN TUTKIMUSLAITOS •TYÖPAPEREITA

LABOUR INSTITUTE FOR ECONOMIC RESEARCH • DISCUSSION PAPERS

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SOURCES OF JOB AND WORKER FLOWS: EVIDENCE FROM A PANEL OF REGIONS[1]

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[1]We are grateful to Eija Savaja (Labour Institute for Economic Research) for her help with the construction of the data.

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Helsinki 2002

ISBN 952–5071–65–0
ISSN 1457–2923

Abstract

The aim of this study is to explore the structure and the dynamics of regional labour markets in terms of gross job and worker flows. The regional turnover rates are related to macroeconomic indicators, demographic factors and industry-structure by employing the data of 85 Finnish regions over the period of 1988–1997. The results imply that different factors can have similar effects on net changes in employment and unemployment by various means of affecting gross changes.

Tiivistelmä

Tutkimuksessa tarkastellaan alueellisten työpaikka- ja työntekijävirtojen rakennetta ja kehitystä. Työpaikkojen ja työntekijöiden vaihtuvuutta selitetään makrotaloudellisilla ja demografisilla tekijöillä sekä toimialarakenteella käyttäen 85 seutukunnan aineistoa vuosilta 1988–1997. Selittävillä tekijöillä voi olla samankaltaisia vaikutuksia työllisyyden nettomuutokseen siten, että ne vaikuttavat eri tavoin työmarkkinoiden bruttovirtoihin.

JEL classification: C23, J63, R23.

Keywords: job flows, worker flows, dynamic panel data estimation.

1. Introduction

Market economies are in a state of continuous turbulence. During the past ten years a growing body of literature has emerged that employs longitudinal, linked employer-employee data in analysing the pace of job reallocation and worker flows. The novelty of this approach follows from the possibility to decompose net employment changes into gross job and worker flows. These gross flows are much larger in magnitude than the observed net changes in employment. Davis and Haltiwanger (1999) report that in most Western economies roughly ten per cent of jobs is created/destroyed each year. Worker flows are even larger in magnitude.

Establishment-level studies have mainly focused on the pace of job reallocation and worker flows in different phases of business cycles and across regions. The U.S. evidence points out that the components of net employment change behave quite differently over time and across regions. Job destruction is primarily associated with cyclical variation, and job creation with regional variation, Eberts and Montgomery (1995). A typical finding is also that gross job flows are persistent; the majority of newly destroyed (created) jobs are not reopened (destroyed) within the next few years. In addition, a substantial part of gross job flows follows from rather large annual changes in plant-level employment, according to Davis and Haltiwanger (1999).

When it comes to country differences, the turnover rates are found to be fairly similar across countries regardless of different labour market institutions (e.g. Nickell, 1998). This observation is consistent with the view put forward in Bertola and Rogerson (1997), according to which the rate of job reallocation is a decreasing function of wage dispersion that tends to be larger in less regulated labour markets.

Even though the differences in job and worker reallocation in different phases of a business cycle and between countries/regions are well reported, the determinants of this evolution have remained relatively unexplored. We aim at shedding some additional light on this issue by analysing the establishment-level turnover rates during the years 1988–1997 in 85 Finnish regional labour markets that share the same labour market institutions and roughly the same wage dispersion. In particular, an effort is made to investigate the impact of macroeconomic factors, migration flows, demographic factors and industry-structure on job reallocation and worker flows.

The issue of interest in this study is closely connected to a large body of literature that explores regional unemployment differentials. An extensive survey by Elhorst (2000) reveals that almost all of these studies have analysed the determinants of regional unemployment through net measures. Against this background, the examination of gross turnover flows along with net flows is interesting in its own right. It may provide new explanations for the factors hanging behind the persistence of regional unemployment disparities.

The study is organised as follows. The second section provides the definitions of the measures of gross job and worker flows. The section also provides stylized facts of gross job and worker flows in Finnish regions. The third section introduces the data and the econometric methods employed in analyses. The fourth section provides the estimation results concerning the effects of various factors on regional job and worker flows. The fifth section concludes.

2. Job and worker flows

The gross flows of jobs and workers measure the number of jobs created/destroyed within establishments, and workers moving in and out of establishments (i.e. hiring and separation of workers). The measure of the job creation rate (JC) is given by

(1) $$JC_t = \sum_i \Delta E_{it}^{+} / ((\sum_i E_{it} + \sum_i E_{i,t-1})/2),$$

where E denotes employment in an establishment i in year t and the superscript "+" refers to a positive change in employment. To get the turnover rate, the overall sum of jobs created is divided by the average employment in periods t and t-1. It can be shown that this definition has several technical advantages over more conventional growth rate measures, see Davis *et al.* (1996).

The measure of the job destruction rate (JD) is calculated similarly as

(2) $$JD_t = \left| \sum_i \Delta E_{it}^{-} \right| / ((\sum_i E_{it} + \sum_i E_{i,t-1})/2),$$

where the superscript "-" refers to a negative change in employment in an establishment i. The job destruction rate is defined as the absolute value of the sum of negative changes in employment within establishments, divided by the average number of employees in time periods t and t-1.

The definitions above can be employed in measuring the net rate of employment change $NET_t = JC_t - JD_t$, the gross job reallocation rate $JR_t = JC_t + JD_t$ and the excess job reallocation rate $EJR_t = JR_t - |NET_t|$. The excess job reallocation is an index of simultaneous job creation and destruction (e.g. Davis and Haltiwanger, 1999). If this measure is positive, the magnitude of (gross) job reallocation in a region exceeds the change in net employment.

In addition to gross job flows, linked employer-employee data provides means to measure gross worker flows. By combining data from two consecutive years, it is possible to calculate the number of employees who have entered a plant during a given year and who are still working at the same plant at the end of the year. The sum of these employees over all plants gives the total worker inflow. By the same token the total worker outflow is obtained by summing up the number of employees who have separated from plants during a year.

Worker inflow (WIF) and outflow (WOF) rates are obtained in a similar fashion to job flows by dividing the total worker inflow/outflow by the average of employment in periods t and t-1. The difference between the hiring rate and the separation rate gives the net rate of change in employment, i.e. $NET_t = WIF_t - WOF_t$.

The hiring (separation) rate can be decomposed by the source (destination) of worker inflow (outflow). To examine the regional dynamics of unemployment, it is convenient to measure the worker inflow rate from unemployment (WIFU) and the worker outflow rate into unemployment (WOFU). The difference between these measures gives the net rate of change in unemployment, i.e. $UNET_t = WIFU_t - WOFU_t$.

The final definitions of job and worker flows consist of the worker flow rate (WF), which is the sum of the hiring (WIF) and separation rates (WOF), and of the churning rate (CF):

(3) $$CF_t = WF_t - JR_t.$$

The churning rate completes the picture of labour adjustment in regional labour markets by combining establishment-level worker and job flows together. The churning rate is also called “excess worker turnover rate” since it compares worker flows with job flows. By this means, the churning rate measures the structural change of regional labour markets within plants.

Job and worker flows needed in empirical analyses are constructed from the employer-employee data that covers more than 80 percent of total employment in the non-farming business sector of the percent of total employment in the non-farming business sector of the Finnish.[1] Annual job and worker flows are aggregated to 85 regions corresponding to the NUTS 4 level of the EU. The public sector has to be excluded from the analyses owing to practical problems in measuring annual gross job and worker flows within public sector establishments. Agriculture is also excluded, since the employer-level data is combined with the employer-level data by using Employment Statistics, which does not include farmers.

Even with these limitations the data covers a substantially larger part of the economy than most of the previous studies on job and worker flows that have concentrated mainly in manufacturing industries (e.g. Davis and Haltiwanger, 1999). What is more, the data covers almost the entire population of establishments and employees in all regions, so the analyses of regional job and worker flows become possible. This is not always the case, especially in the U.S. (see Davis *et al.* 1996, 222–223; Shimer 2001, 999–1000).

Figures 1–2 report regional job flows for selected years.[2] There are several observations to be made. First, regions differ substantially in their ability to create jobs. The largest differences in gross job creation rates are found to be 20–30 points. Second, the variation in job destruction rates is less pronounced, the difference being some 15–25

[1] The linked employer-employee data set is formed by Statistics Finland by combining various administrative registers of individuals together with business registers. The resulting data set is rich in information over both establishments and individuals. The industries are the following: mining (C), manufacturing (D), energy etc. (E), construction (F), trade (G), hotels and restaurants (H), transportation etc. (I), finance (J), and real estate, business services etc. (K). This means that agriculture, forestry and fishing (A; B), public administration (L), education (M), health and social work (N), other social and personal services (O), international organisations (Q), and industry unknown (X) are excluded from the evaluation of the regional gross job and worker flows. The labour force status of individuals is measured during the last week of December.

[2] For expository purposes all measures are multiplied by 100 in all figures.

points. Third, the recovery from the depression happened in all regions both by an increase in the rate of job creation and by a decline in the rate of job destruction.

Figure 1. The gross job creation rates (JC) in Finnish regions in 1991 and 1994.

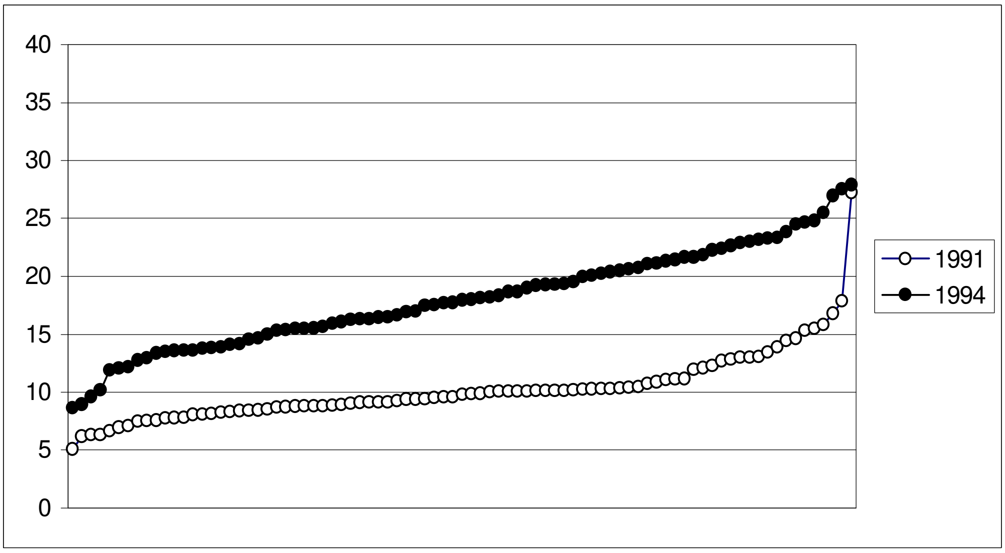
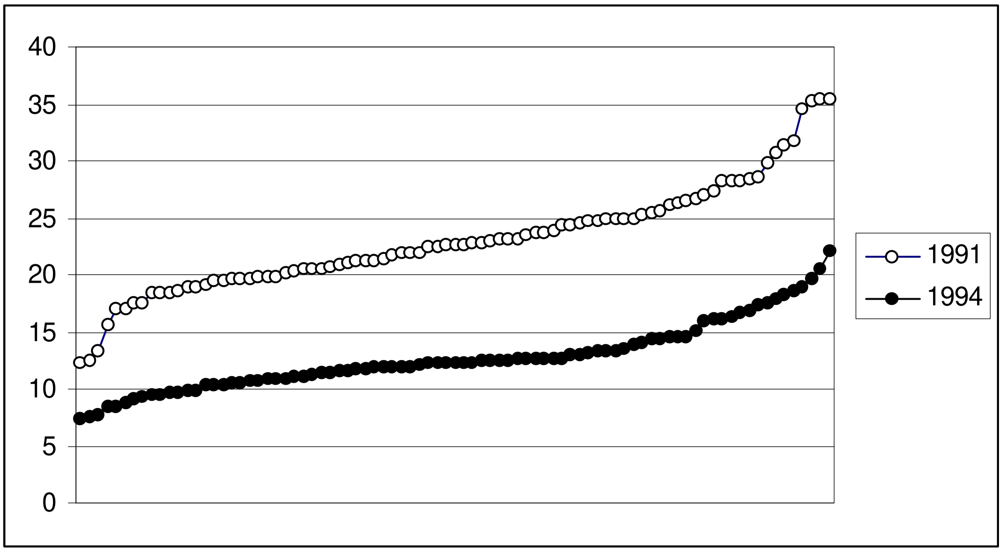
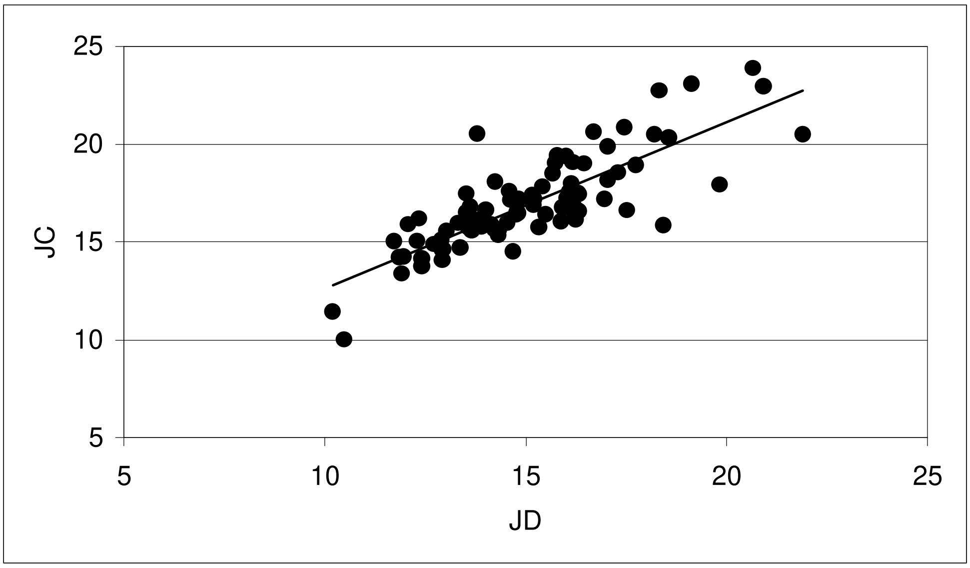


Figure 2. The gross job destruction rates (JD) in Finnish regions in 1988 and 1991.



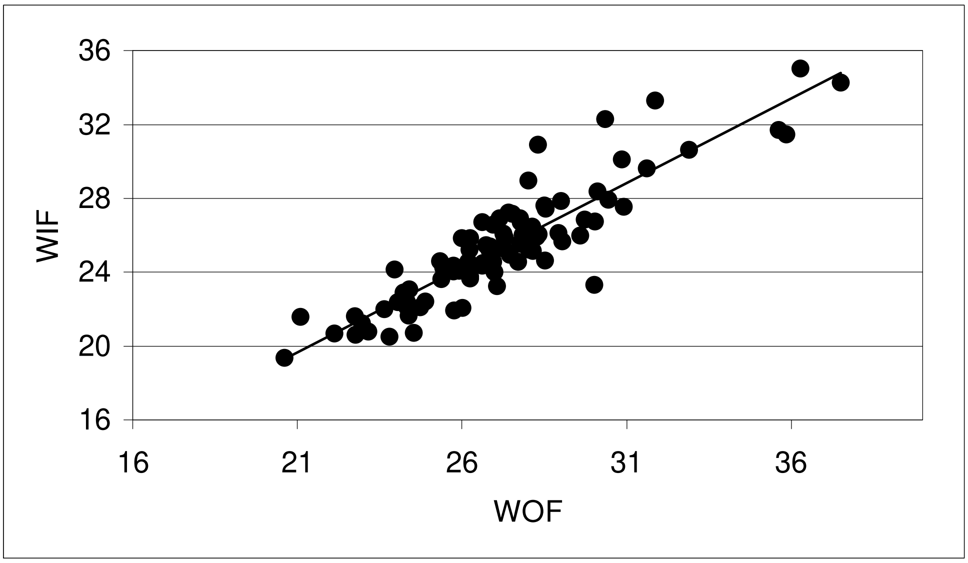
The most interesting observation reveals the strong connection between the average job creation and the job destruction rates (Fig. 3), and the equally strong correlation between the worker inflow and outflow rates (Fig. 4).[3] This means that regions with a high ability to create jobs (hirings) also tend to experience sizeable job losses (separations). The findings are similar to the ones reported in Greenway *et al.* (2000), who analysed gross job flows in different U.K. industries. It should be emphasized that the positive correlation cannot be totally contributed to the intensive entry and exit of firms/ establishment in the service sector, i.e. to the industry structure of regions. Ilmakunnas and Topi (1999) report that entry and exit count only for some three per cent of overall change in employment, and Finnish regions are not completely specialized.

Figure 3. The scatterplot of the average job creation rates (JC) and the average gross job destruction rates (JD) across Finnish regions.



[3] The high rates of job creation and job destruction are observed especially in Northern Finland, and low rates in Eastern Finland. One potential explanation for this is provided by active labour market policy that is extensively targeted to Northern Finland. It should be noted, however, that the reported job flows are calculated by comparing the situation within an establishment between the end of year t and the end of year t-1, and that the duration of a typical subsidised job period is six months. Accordingly, these spells are not, at least totally, included in the measures of gross job flows.

Figure 4. The scatterplot of the average worker inflow rates (WIF) and the average worker outflow rate (WOF) across Finnish regions.



3. Empirical specifications

The time period of empirical analysis spans the years 1988–1997. These years include a rapid increase in unemployment in the early 1990s (from 4 per cent to almost 20 per cent) and the gradual decrease in unemployment from the mid 1990s onward. (For the analysis of the Finnish recession, see Honkapohja and Koskela, 1999.) The changes were not evenly distributed across regions, so data offer a unique opportunity to investigate the factors influencing the differences in job and worker turnover rates among regions.

Regional job and worker flows are explained by various factors that control for observable differences in regional growth, productivity, labour force, demographics, migration and industry structure.[4] This information is collected from different registers maintained by Statistics Finland. Time varying changes that are common to all regions are controlled by the real interest rate and by the terms of trade. The inclusion of year dummies instead of these variables produces the same results.

Gross job and worker flows have been observed to depend on the business cycle, so the change in regional production per capita is also included among the regressors in this study. Other terms named as macroeconomic indicators control for observable differences in the financial situation of municipalities and in regional productivity. The inclusion of the regional productivity term is motivated by findings according to which an increase in productivity may have a positive impact on employment in growing establishments, see Bartelsman and Doms (2000).

Variables of demographics and migration reflect regional differences in education, age structure and in-migration. The proportion of unskilled individuals in the labour force (UNSK) is included in the analysis to take account of possible changes in the composition of labour demand that are put forward in the literature of skill-biased technological change (e.g. Atkinson, 1999). The other variable controlling for the impact of demographic factors on labour market flows is the proportion of individuals over the age of 55 to the population (AGED). A shift in labour demand away from older workers is expected to show up in the parameter estimates of this variable.

Gross migration flows form an important part of the reallocation of labour force. Furthermore, the clustering of producers and workers at a particular region creates positive externalities that boost the growth of the region, see Krugman (1998) among others. If this is the case, in-migration is positively connected to job creation and the hiring rate. The effect of in-migration on job destruction and worker outflow is less evident, a priori. Provided that migrants compete with workers and unemployed persons living in destination areas, higher in-migration may increase worker outflow rates. Accordingly, the net effect of in-migration remains an empirical issue.

We next turn to the industry structure. The earlier empirical studies have shown that there are differences in the evolution of gross job and worker flows across industries (e.g. Davis and Haltiwanger, 1999). This observation has been connected to regional differences in Böckerman and Maliranta (2001), who examined gross and net flows in twenty provinces of Finland. They found out that the 2-digit standard industry classification helps to explain a part of the observed differences in regional net employment changes. However, the industry structure was of limited value in

[4] For the definition of these variables, see Appendix 1. The summary statistics are reported in Appendix 2.

explaining the differences in regional gross job and worker flows. It is interesting to examine whether this also holds true in a more complex setting.

Since the data cover all NUTS4 regions in Finland, the natural starting point for the analysis is the fixed effects model of the form:

(4) $$Y_{it} = \beta X_{it} + \eta_i + \delta_t + e_{it},\ i = 1, \ldots, 85;\ t = 1, \ldots, 10,$$

where Y stands for the selected measure of job or worker flow and X is a vector of explanatory variables. The unobserved regional effect, η_i, is taken to be constant over time and specific to each region i. The individual effects are allowed to correlate with the explanatory variables. Any time-specific effects that are not included in the model are accounted for by the regional-invariant time effects, δ_t. Finally, the remaining disturbances, eit, are assumed to be independently and identically distributed over i and t.

According to certain assumptions the model set up in equation (4) can be consistently and efficiently estimated by means of the within-group estimator (e.g. Hsiao, 1985; Baltagi, 1995). However, in the current context the within-group estimator has at least two potential shortcomings. Firstly, it assumes that all explanatory variables are strictly exogenous, i.e. uncorrelated with the past, present and future realisations of e_{it}. This assumption is violated, for instance, if an unexpected shock to job creation or worker flows in some region affects the future in-migration to that region. Secondly, the within-group estimator generates inconsistent estimates in dynamic specifications if the number of time periods is fixed (see Nickell, 1981).

To overcome these difficulties, we also analyse the data by means of the following dynamic model:

(5) $$Y_{it} = \sum_{k=1}^{P} \alpha_p Y_{i,t-k} + \sum_{k=0}^{P} \beta_p X_{i,t-k} + \eta_i + \delta_t + \varepsilon_{it}\ .$$

The model set up in equation (5) can be consistently estimated by employing the Arellano-Bond (1991) GMM method for the first differenced equation. Although differencing eliminates the individual effects, it induces a negative correlation between the lagged dependent variable, ΔY_{it-1}, and the disturbance term $\Delta\varepsilon_{it}$. The Arellano-Bond method overcomes this problem by employing linear orthogonality conditions $E(Y_{i,t-s} \Delta\varepsilon_{it}) = 0$ for t = 3, … , T and $2 \leq s \leq t-1$ and p = 1, as instruments for the lagged dependent variable. In addition, all leads and lags of strictly exogenous explanatory variables can be employed as instruments for all equations in first differences.

If the assumption that the explanatory variables are strictly exogenous with respect to ε_{it} does not hold, some of the explanatory variables are correlated with the disturbance term as $E(X_{it}\ \varepsilon_{is}) \neq 0$ if $s \leq t$. In this case, the valid instrument set for period t consists of lagged values of the dependent variable $Y_{i,t-s}$, $s \geq 2$ and of the the lagged values of endogenous variables $X_{i,t-s}$ $s \geq 2$. Accordingly, the set of valid instruments becomes larger as t increases. Monte Carlo experiments show that the use of the full set of moment conditions in the later cross-sections may result in over-fitting biases in the estimates (see Arellano and Honore, 2000). For this reason, it is advisable to remove the least informative instruments from the instrument set.

Dependent variables at time t are based on the changes in the number of jobs/workers within establishments between the last weeks of periods t-1 and t. These are related to a set of strongly exogenous variables and to a set of endogenously determined variables. Strongly exogenous variables are allowed to influence job and worker flows from periods t-1 and t-2. In the case of endogenous variables, the effects are allowed to arise from the current period, t, and from the period t-1.

There are three endogenous variables, viz. the rate of in-migration, the share of highly educated individuals among in-migrants, and the change in regional production per capita (DGDP). The underlying hypothesis of this specification is that individuals move for work-related reasons, in which case an unexpected drop in, say, job creation is, already reflected in in-migration during the period t. At the same time, this drop is allowed to affect regional production. Finally, regional productivity is measured from the period t-2 to avoid the possible correlation with the DGDP variable. It should be noted, however, that adding the productivity term lagged once produces similar results to those reported below.

4. The results

The results differ sharply between the unreported conventional fixed effects models and the dynamic GMM models reported in tables 1 and 2.[5] This is mainly due to the lack of dynamics in the static fixed effects specification. If the same lag structure is employed in fixed effects estimations as in GMM estimations, the results become similar between different methods in qualitative terms. Naturally, the parameter estimates differ, owing to the misspecification of the FE model when lagged endogenous variables are included in the estimation (see Nickell, 1981). Since the preliminary results imply that the conventional, static fixed effects model can produce seriously biased results, at least in the current context, we focus on the results of GMM models in what follows.

Three cross-sections are lost in constructing lags and taking first differences in dynamic specifications. The GMM results correspond to specifications with the minimum number of instruments that managed to pass the implemented tests for the second-order autocorrelation, AR(2), and for the validity of the instrument set, SARGAN. More extensive instrument sets produce largely similar results to those reported in Tables 1 and 2. The only difference is that some variables reported as insignificant turn out to be statistically significant. This indicates the presence of an over-fitting bias in large instrument sets discussed in Arellano and Honore (2000). By and large, the parameter estimates are also robust to different specifications of migration flows and regional DGDP. However, if these variables are modelled as exogenous, all models fail to pass the SARGAN test for the validity of the instrument set.

The cyclical properties of job and worker flows have gained a lot of attention in the analysis of linked employer-employee data. In the current setting, this issue can be explored through the parameter estimates of the DGDP variable. The results show that an increase in regional GDP expands job creation and the hiring rate while decreasing job destruction and worker outflow. This finding is in line with previous Finnish studies in which gross flows are measured in different phases of a business cycle, see Ilmakunnas and Maliranta (2000).

[5] The results of the unreported fixed effects models are available from the authors on request.

In addition to the cyclical nature of gross job and worker flows, three further observations are worth making from the parameter estimates of DGDP. First, the long-run elasticity with respect to worker inflow from unemployment (WIFU) is lower than the one with respect to total worker inflow (WIF). This implies that establishments tend to hire proportionally more employees from other establishments (and from the pool of students) than from the pool of unemployed persons during a surge of economic activity. Second, the long-run elasticity with respect to worker outflows follows the same pattern, a reduction in total worker outflow being greater than in worker outflow into unemployment. These observations are also shown in net employment and net unemployment equations, economic growth having a larger impact in the former one. Finally, the excess job reallocation rate is procyclical, i.e. the magnitude of simultaneous gross job creation and destruction declines during the times of economic slowdown. This finding is in line with previous Finnish studies and contrasts the U.S. evidence reported in Davis and Haltiwanger (1999).

Economic growth provides only a partial explanation for regional differences in job and worker flows. According to the results, regional productivity, which also reflects the profitability of firms situated in a region, helps to explain a large part of differences in regional job and worker flows. The effect of productivity is found to be more pronounced in the case of job flows than worker flows. The long-run difference between the lowest and the highest value of productivity between the regions and over time is estimated to be as large as 0.70 in job creation and 1.22 in the net rate of employment change. These figures are large but not totally out of line. The job creation rate may vary between 0 and 2, whereas the range of the net rate of employment change varies between –2 to 2. However, since the actual difference between the highest and the lowest value of the net rate of employment change is some 0.7 points, the magnitude of estimates has to be considered with some caution.[6] The estimates may pick up some unobservable factors that are not included in estimations.

The results show that in-migration (MIG1) boosts job creation and the hiring rate, the finding being consistent with the predictions of new economic geography, see e.g. Fujita *et al.* (1999). These positive gross effects result in an improvement in the net rate

[6] We have also experimented with the models that did not contain the productivity term. The unreported results show that the results remain largely consistent with the ones reported in Tables 1 and 2. Even though the dropping of the productivity term enhances some of the parameter estimates, the qualitative results remain the same.

of employment change (NET) and in a reduction in the net rate of unemployment change (UNET). Favourable net effects are found to become even larger if in-migrants are highly educated. Having said that, the favourable effects of in-migration may materialise at the cost of workers living in a destination region as indicated by the positive and statistically significant parameter estimate of MIG1 in the worker outflow equation. There is also some evidence that it takes time before migrants establish themselves in the labour markets of destination areas. This is highlighted in the churning rate equation (CF) in which a large inflow of migrants is found to yield a high rate of excess worker reallocation.

It is somewhat surprising to notice that demographic factors have only a modest role in determining regional job and worker flows. Even though, the results imply that fewer jobs are created, and more jobs are destroyed, in regions with unskilled labour (UNSK) or aged population (AGED), there are no statistically significant effects of demographic factors on net employment. The parameter estimates of UNSK imply that this variable might enter as in first differences in the net employment equation, since the parameter estimates from different lags are opposite in sign and almost equal in absolute magnitude. The experiments with first differences produced, however, the same results as above the parameter estimates of UNSK remaining insignificant.

Having said that, there is some evidence that regions with a high proportion of persons aged 55 or over tend to have a smaller hiring rate (WIF) and larger worker outflows into unemployment (WOFU) than other regions, other things being equal. Naturally, the high separation rate into unemployment also results in a poor employment record. In addition, an increase in the share of old persons to the population reduces the magnitude of gross job and worker reallocation (JR). This finding is likely to reflect the high turnover rates of younger people.

The parameter estimates of variables controlling for observable differences in the industry structure are reported in the lower parts of Tables 1 and 2. The difficulties faced by agricultural regions (omitted category) are evident in the results. Various industry variables enter net employment and unemployment equations positively and statistically significantly. Interestingly, these favourable net effects arise mainly from the better ability of regions to create jobs/to hire new workers. The rates of job destruction/worker outflow remain largely the same between regions with different industry structures, with other things being equal.

The finding that the industry structure is a more significant factor in explaining the regional variation in job creation than in job destruction is consistent with Eberts and Montgomery (1995), who discovered that job creation is primarily associated with regional variation and job destruction with cyclical variation. These observations have a direct relevance for regional policy. If the target is to increase the number of jobs in a region, public measures should be aimed at improving the preconditions for the birth of new firms rather than aiding contracting firms.

5. Conclusions

During the past ten years the analyses of linked employer-employee data sets have contributed to our knowledge on the adjustment of labour markets. These analyses are typically based on the examination of aggregated measures of job and worker flows in different phases of a business cycle. In some studies the issue of interest has focused on regional differences in the adjustment of the labour market to changes in the overall economic situation.

This study aims to broaden the picture of regional differences in job and worker flows by combining the measures of job and worker flows together with data on various factors that describe the labour market and the economy of a region. It is shown that labour market dynamics differ markedly between regions of a single country despite similar labour market institutions and labour legislation. As in previous analyses of linked employer-employee data, job and worker flows are shown to behave cyclically. In addition, the results indicate that observable differences in regional productivity, labour force, demographics, in-migration and industry structure help to explain the prevailing disparities in regional labour markets.

The results reveal that the estimated impact on a net change can occur in many ways. For instance, the net rate of employment change is higher in booming regions where labour productivity is high, owing to greater job creation and lower job destruction. Net changes are also favourable in regions with a large manufacturing sector or an expanding electronics industry, but for other reasons: the share of manufacturing or electronics is found to improve job creation and has no significant effect on job destruction. This implies that the mere examination of the factors affecting net employment/unemployment masks some interesting dynamics happening at the establishment-level in regions.

When it comes to the regional disparities, the following can be said about the factors influencing regional job and worker flows. More jobs are created in growing regions where manufacturing, electronics and service sectors are large. These regions gain more in terms of job creation and hiring from extensive in-migration that is directed to growth centres. This happens, however, with the cost. Migrants also tend to increase worker outflow that may be caused by the displacement of workers living in a destination region.

In contrast to growing regions, contracting regions with a large share of agriculture, small in-migration and old population face difficulties. The main reason for the poor record of net employment in these areas is the modest job creation and, accordingly, a low rate of hiring new employees. The situation is further worsened by the finding that the older the population the more extensive is the worker outflow into unemployment. Due to the absence of background characteristics that were found to boost job creation, the recovery of contracting regions remained weak, even in the era of rapid economic growth. Unfortunately, there seems to be no shortcut from the trap of high unemployment.

What advice can we then give to contracting regions with high unemployment? Given the persistence in regional unemployment differences, it is perhaps not surprising that we cannot give much. Growth, productivity and in-migration are related to the prevalent success of a region. The structure of in-migration is also unfavourable in contracting regions and results in even larger differences in the demographics and in the quality of the labour force among areas. Having said that, the results do give one policy suggestion that is easy to implement. If the target of policy-makers is to increase the number of jobs in contracting regions, public measures should be aimed at improving the preconditions for the birth of new firms rather than aiding contracting firms.

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Table 1. The GMM results for job flows.

Dependent	JC	JD	NET	JR	EJR
Dependent$_{t-1}$	-0.176**	-0.091	-0.326**	0.087	-0.040
Macroeconomic indicators					
DGDP$^{+}_{t}$	0.005**	-0.006**	0.010**	0.001	0.003**
$_{t-1}$	0.007**	-0.005**	0.013**	0.003*	0.003
PROD $_{t-2}$	0.666**	-0.441**	1.306**	0.288*	0.335
DEBT $_{t-1}$	0.002	0.000	-0.004	0.002	0.005
$_{t-2}$	0.000	0.005	-0.001	0.004	-0.004
REAL $_{t}$	0.003**	-0.001	0.003	0.005*	-0.007**
TERM $_{t}$	-0.003**	0.005**	-0.006**	0.000	0.004**
Labour force and migration flows					
MIG1 $^{+}_{t}$	3.642**	-1.875	6.495**	-0.981	9.475**
$_{t-1}$	0.804	0.827	1.788	0.242	-3.898*
MIG2 $^{+}_{t}$	0.360	-0.102	0.581*	-0.192	0.930
	0.186	-0.047	0.181	-0.029	0.161
AGED $_{t-1}$	-0.538	0.442	-1.042	0.292	-1.337
$_{t-2}$	-1.669**	-0.278	-0.595	-2.415**	-1.923
UNSK $_{t-1}$	1.751**	-1.271	1.360	1.047	1.153
$_{t-2}$	-0.506	1.486*	-1.235	0.994	-1.052
Industry-structure variables					
MANU $_{t-1}$	0.063	0.081	-0.199	0.256	-0.056
$_{t-2}$	0.420**	-0.227	0.619**	0.172	0.159
ELEC $_{t-1}$	0.343*	-0.380	0.634**	0.054	0.300
$_{t-2}$	-0.222	0.383	-0.581	0.205	0.776
SERV $_{t-1}$	0.293	0.427	0.284	0.602	0.013
$_{t-2}$	0.573**	-0.055	0.603	0.489	0.756**
PUBL $_{t-1}$	0.579*	0.034	0.442	0.695*	0.138
$_{t-2}$	0.264	-0.404	1.028**	-0.202	-0.190
HIGH $_{t-1}$	-0.441**	0.186	-0.395	-0.204	-0.591*
$_{t-2}$	-0.014	0.487**	-0.464	0.449	-0.952
HISE $_{t-1}$	-0.258	0.103	-0.570	0.045	0.781
$_{t-2}$	0.062	1.116*	-1.254*	1.726*	-0.898
Test statistics					
WALD	0.00	0.00	0.00	0.00	0.00
SARGAN	0.13	0.32	0.29	0.20	0.17
AR(2)	0.92	0.99	0.67	0.40	0.55
Instruments					
Lag length	2	1	2	2	1

Notes: The results correspond to the 1-step estimates excluding the SARGAN test for overidentifying restrictions and the AR(2) test for the second order autocorrelation of the residuals that correspond to the 2-step estimates. The superscript '+' indicates that the variable is instrumented. ** (*) indicates that the parameter estimate is statistically significant at the 5 (10) per cent significance level. The WALD test is a test for the joint significance of the explanatory variables. All test statistics are reported as p-values. Instruments indicate the number of lags of the dependent variable and the predetermined variables employed in the instrument matrix.

Table 2. The GMM results for gross worker flows.

Dependent	**WIF**	**WIFU**	**WOF**	**WOFU**	**UNET**	**WF**	**CF**
Dependent $_{t-1}$	-0.210**	0.297**	-0.044	-0.201**	-0.406**	0.122**	0.088
Predetermined variables							
DGDP^{+} $_{t}$	0.005**	0.002**	-0.005**	-0.004**	0.004**	0.002	0.001
$_{t-1}$	0.007**	0.003**	-0.004**	-0.004**	0.008**	0.004**	0.001
PROD $_{t-2}$	0.607**	0.320**	-0.374**	-0.333**	0.889**	0.435**	0.076
DEBT $_{t-1}$	0.002	-0.001	-0.001	-0.003	0.001	0.001	0.000
$_{t-2}$	0.002	0.001	0.006	0.004*	0.002	0.006	0.003
REAL $_{t}$	0.000	0.002**	-0.002	-0.008**	0.008**	0.003	-0.003
TERM $_{t}$	-0.005**	-0.009**	0.004**	-0.001	-0.004**	-0.001	-0.002*
Labour force and migration flows							
MIG1^{+} $_{t}$	12.687**	1.219	1.254	-0.175	3.881**	4.560	7.381**
$_{t-1}$	4.193**	0.919	3.287**	-0.257	2.153*	3.319*	4.727**
MIG2^{+} $_{t}$	1.690**	0.106	0.121	-0.197	0.439**	-0.188	0.388
$_{t-1}$	0.274	0.051	-0.068	0.124	-0.009	-0.222	0.018
AGED $_{t-1}$	-0.767	0.615	0.648	-0.670	0.250	0.623	0.211
$_{t-2}$	-2.018**	-0.490	-0.630	0.851*	-1.388*	-3.171**	-0.612
UNSK $_{t-1}$	1.225	0.395	-2.078	-0.563	0.130	-0.544	-1.344
$_{t-2}$	-1.642	-0.279	1.506	0.092	0.182	1.856	-0.077
Industry-structure							
MANU $_{t-1}$	-0.150	0.082	0.068	0.024	-0.125	0.369	-0.012
$_{t-2}$	0.451**	0.234**	-0.172	0.038	0.170	0.330	0.128
ELEC $_{t-1}$	0.297	-0.060	-0.447*	-0.401**	0.460**	-0.107	-0.067
$_{t-2}$	-0.671	-0.187*	0.080	0.272	-0.688**	-0.277	-0.600
SERV $_{t-1}$	0.275	0.427**	0.390	0.100	0.894**	0.877*	0.025
$_{t-2}$	0.720**	0.187	0.092	0.127	0.196	0.830**	0.362**
PUBL $_{t-1}$	0.329	0.169	-0.042	-0.214	0.657**	0.792	-0.049
$_{t-2}$	0.192	0.512**	-0.369	0.205	0.628**	-0.135	0.050
HIGH $_{t-1}$	-0.548**	0.078	0.180	0.090	0.018	-0.296	-0.208
$_{t-2}$	-0.054	0.148	0.314	0.162	0.168	0.203	-0.258
HISE $_{t-1}$	0.364	-0.387*	0.440	-0.712**	0.256	0.367	0.545
$_{t-2}$	-0.622	0.029	0.836	0.658	-0.988*	1.232	-0.698
Test statistics							
WALD	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SARGAN	0.07	0.65	0.16	0.18	0.50	0.10	0.69
AR(2)	0.09	0.58	0.21	0.75	0.12	0.08	0.64
Instruments							
Lag length	1	3	1	2	3	2	1

Notes: Please see table 1.

Appendix 1. The description of variables.

Variable	Definition/measurement
a. The measures of gross job flows	
JC	**Gross job creation rate in region i**
JD	**Gross job destruction rate in region i**
NET	**JC-JD (=WIF-WOF) in region i**
JR	**Gross job reallocation rate (=JC+JD) in region i**
EJR	**Excess job reallocation rate in region i**
b. The measures of gross worker flows	
WIF	**Worker inflow rate in region i**
WIFU	**Worker inflow rate from unemployment in region i**
WOF	**Worker outflow rate in region i**
WOFU	**Worker outflow rate into unemployment in region i**
UNET	**WIFU-WOFU in region i**
WF	**Worker flow rate (=WIF+WOF) in region i**
CF	**Churning rate (=WF-JR) in region i**
c. The macroeconomic indicators	
DGDP	**Per cent change in (GDP in region i / population in region i)**
PROD	**A log in (value added in region i / employment in region i)**
DEBT	**(long-term municipal debt held in region i / population in region i) $*10^{-3}$**
REAL	**Real average lending rate by the Finnish banks (deflated by production price index) (Source: Bank of Finland; Statistics**
TERM	**Terms of trade (export price index divided by import price index) (Source: Statistics Finland)**
d. The measures of labour force and migration flows	
MIG1	**Gross in-migration (total) to region i/ population in region i**
MIG2	**Gross in-migration of persons with higher university degrees to region i / gross in-migration (total) to region i**
AGED	**The number of individuals aged 55+ in region i / population in region i**
UNSK	**The number of individuals with basic education only in labour force in region i / labour force in region i**
e. The measures of industry-structure	
AGRI	**Value added by agriculture in region i / GDP in region i (reference)**
MANU	**Value added by manufacturing in region i / GDP in region i**
META	**Value added by metal industries in region i / GDP in region i**
ELEC	**Value added by electronics in region i / GDP in region i**
SERV	**Value added by private services in region i / GDP in region i**
PUBL	**Value added by public sector in region i / GDP in region i**
HIGH	**Value added by high-tech manufacturing in region i / GDP in region i**
HISE	**Value added by high-tech services in region i / GDP in region i**

Appendix 2. Descriptive statistics (from 1988 to 1997).

Variable	Mean	STD	MIN	MAX
JC	0.145	0.056	0.051	0.466
JD	0.177	0.060	0.059	0.445
NET	-0.032	0.086	-0.374	0.330
JR	0.322	0.078	0.135	0.853
EJR	0.250	0.077	0.102	0.844
WIF	0.246	0.073	0.120	0.577
WIFU	0.044	0.031	0.000	0.181
WOF	0.278	0.066	0.139	0.497
WOFU	0.062	0.035	0.007	0.321
UNET	-0.018	0.039	-0.275	0.135
WF	0.524	0.109	0.277	0.984
CF	0.202	0.061	0.072	0.516
DGDP*	0.445	6.259	-22.314	20.114
PROD	12.244	0.192	11.779	12.946
DEBT	5.125	1.521	1.411	11.179
REAL	7.532	2.722	4.182	12.470
TERM	97.30	3.331	91.70	101.50
MIG1	0.027	0.008	0.010	0.055
MIG2	0.151	0.033	0.075	0.267
AGED	0.266	0.038	0.174	0.375
UNSK	0.354	0.049	0.213	0.509
AGRI	0.152	0.093	0.003	0.420
MANU	0.320	0.119	0.074	0.638
META	0.056	0.063	0.000	0.544
ELEC	0.031	0.034	0.000	0.400
SERV	0.323	0.072	0.177	0.631
PUBL	0.205	0.056	0.089	0.401
HIGH**	0.008	0.029	0.000	0.344
HISE**	0.016	0.011	0.000	0.063

Notes: * = Data available for the years 1989–1997. ** = Data available for the years 1988–1996.