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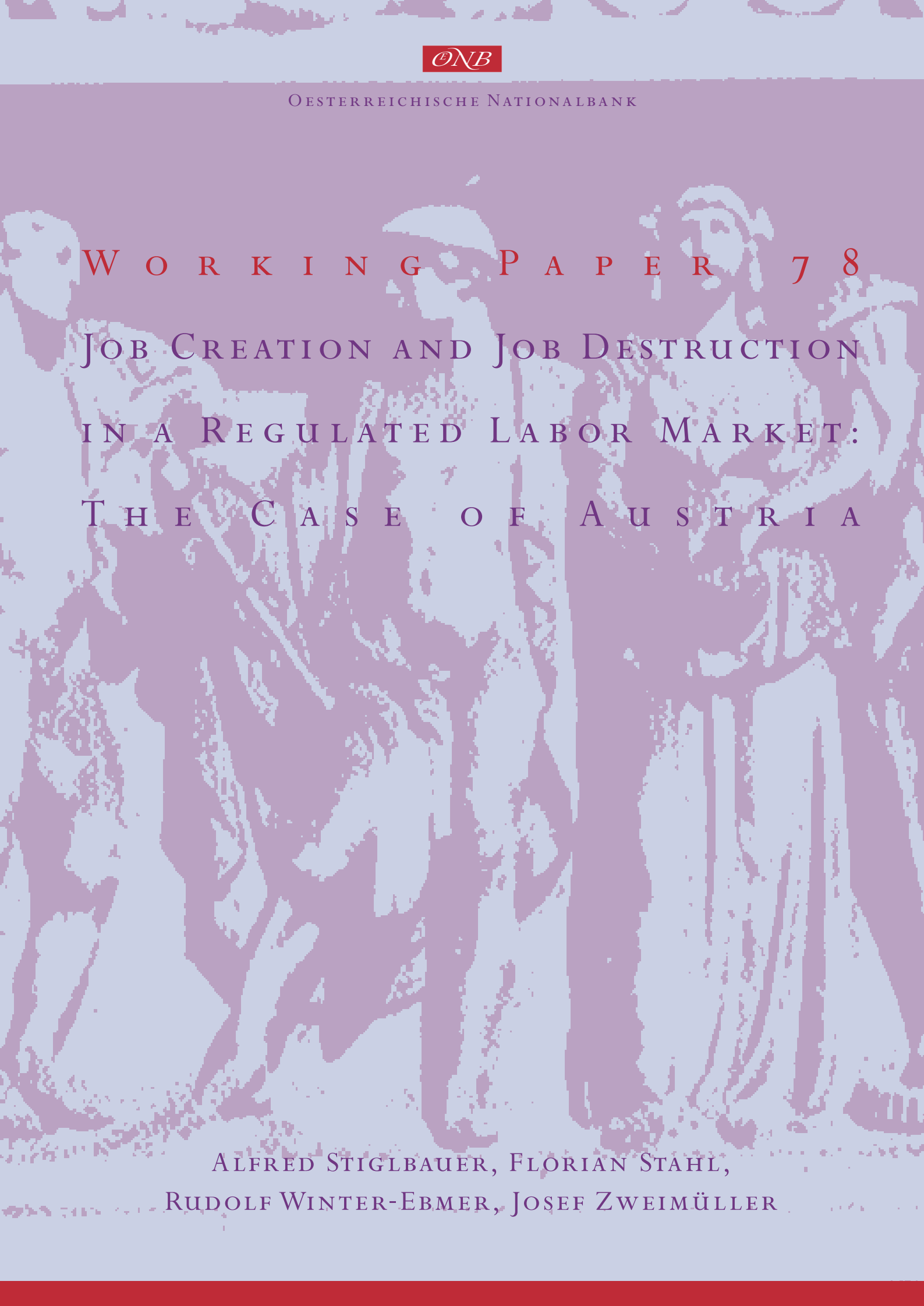

WORKING PAPER 78

JOB CREATION AND JOB DESTRUCTION IN A REGULATED LABOR MARKET: THE CASE OF AUSTRIA

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Editorial

In this paper, Alfred Stiglbauer, Florian Stahl, Rudolf Winter-Ebmer and Josef Zweimüller study Austrian job reallocation in the period of 1978 to 1998, using a large administrative dataset where they correct for "spurious" entries and exits of firms. On average 9 out of 100 randomly selected jobs were created within the last year, and about 9 out of randomly selected 100 jobs were destroyed within the next year. Hence, the magnitude of Austrian job flows seems to be comparable to other countries, similar to the well-known results of Davis, Haltiwanger, and Schuh (1996) for the United States. Job reallocation appears to be driven primarily by idiosyncratic shocks. However, job creation increases significantly during cyclical upswings whereas job destruction rises in downturns. The authors also find substantial persistence of job creation and destruction. They show that the pronounced pattern of job reallocation rates, falling with firm size and age, continues to hold when a set of controls is used. Finally, it is shown that Austrian job reallocation rates are only half the rates for the U. S. This result is not surprising given the impact of tighter regulation and labor law in Austria.

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Job Creation and Job Destruction in a Regulated Labor Market: The Case of Austria

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Revised version,
October 2002

Rudolf Winter-Ebmer is also associated with CEPR, IZA, and WIFO, Josef Zweimüller is also associated with CEPR, CESifo, and IZA. We want to thank Harald Köfler from the *Gebietskrankenkasse Oberösterreich* for providing us with helpful information concerning the data. Support by the Austrian National Bank *(Jubiläums-fonds)* is gratefully acknowledged as well as comments from an anonymous referee, seminar participants at Linz, and at the Austrian Labor Workshop in Vienna. Martin Heineck did an excellent job in preparing the data.

Abstract

We study Austrian job reallocation in the period of 1978 to 1998, using a large administrative dataset where we correct for "spurious" entries and exits of firms. We find that on average 9 out of 100 randomly selected jobs were created within the last year, and that about 9 out of randomly selected 100 jobs were destroyed within the next year. Hence, the magnitude of Austrian job flows seems to be comparable to other countries, similar to the well-known results of Davis, Haltiwanger, and Schuh (1996) for the United States. Job reallocation appears to be driven primarily by idiosyncratic shocks. However, job creation increases significantly during cyclical upswings whereas job destruction rises in downturns. We also find substantial persistence of job creation and destruction. We show that the pronounced pattern of job reallocation rates falling with firm size and age continues to hold when we use a set of controls. Finally, we show that - controlling for sector and for firm size composition - Austrian job reallocation rates are only half the rates for the U. S. This result is not surprising given the impact of tighter regulation and labor law in Austria.

JEL: D21, J23, L11

Keywords: Labor Reallocation, Job Flows, Labor Market Regulation.

1. Introduction

The analysis of gross flows in the labor market has attracted much attention by labor economists and macroeconomists in recent years. U. S. studies revealed a large degree of job reallocation in all sectors, all regions and all periods - a result which was confirmed by later European studies. The main advantage of looking at gross rather than net employment changes is that gross flows uncover patterns of job creation and job destruction and so reveal important information about the underlying forces that lead to changes in employment in the aggregate.

In this paper we provide empirical evidence on patterns of job creation and destruction in the Austrian labor market. Austria is an interesting case per se due to its particular labor market institutions. These institutions, characterized by rather strong firing restrictions and an important voice of unions with respect to employment decisions at the firm level, should be of central importance for explaining the allocation and reallocation of labor. Concerning job security provisions, Austria is among the most highly regulated countries (Emerson, 1988). The Protection Against Dismissal Law applies to all firms with at least 5 employees and requires the approval of the works council in the case of a layoff. Specially protected individuals consist of shop stewards, handicapped and women on maternity leave. In practice, the cooperation of works-councils in redundancy cases enhances the group of specially protected individuals to elderly persons and those more tenured, who might otherwise protest against the dismissal owing to 'social hardship clauses'. Wrongful termination lawsuits are seldom and mostly result not in reinstatement but in the payment of a financial compensation. General severance pay in the case of layoff has also recently been introduced for blue-collar workers and is determined by the length of service. Special rules for mass redundancies, concerning pre-notification, social plans and special arbitration bodies should further hamper firing.

It is therefore suggestive to ask whether the job flow patterns observed in the U.S. do also hold for Austria. Studies for other European countries have generally found that job turnover is high also in Europe, especially in the Scandinavian countries (e. g. Persson, 2000 for Sweden) and somewhat lower rates in Germany (Boeri and Cramer, 1992)[1]. First results for Aus-

[1] See OECD (1994) and Davis and Haltiwanger (1999) for comprehensive surveys. Interestingly, the highest job reallocation rates have been found for Italy (Contini et al., 1995), the country with the highest rate of employ-

tria (Hofer et al., 2001) indicate that Austrian job flows are similar to those in comparable European countries. These results are astonishing given the usual prejudice, that, compared to the U.S. "hiring and firing economy", the Austrian labor market is a highly regulated one.

We use a new and large dataset to look at patterns of job creation and job destruction in Austria. These data come from the Austrian social security office and provide information on the universe of Austrian employees in the private sector. These data contain complete employment histories of the covered workers, and allow also tracing out employment series of individual firms, as the data on individuals also contain information on the sequence of jobs held by these individuals in different firms. Using these firm identifiers it is possible to construct firm-specific panel data, in particular information on employment (firm size), age, sector, and region to provide first evidence on patterns of job creation and job destruction in Austria. Information on firm size and firm age, as well as region and industry together with the fact that our data set is exhaustive allows to be more precise than previous studies on the structural determinants of job reallocation.

Starting with the work of Leonard (1987) and Davis, Haltiwanger, and Schuh (1996), economists began to make extensive use of micro data to study employment behavior at the firm level in order to explain the dynamics of aggregate employment. Interest in empirical evidence on job reallocation by labor economists was further spurred by macroeconomists who traditionally have tried to analyze the labor market in terms of aggregate variables, but recently have begun to pay more attention on what is going on at the micro-level. Moreover, there is a close relationship of the job flows literature to the field of industrial organization because of the shared interest in the role of firm age and size in the job generation process.

Perhaps the most striking results from these studies were the high job creation and destruction rates found in almost all industries. These results suggest that idiosyncratic shocks at the micro level are of paramount importance. Hence looking at aggregate employment figures hides a considerable part of the dynamics. Furthermore, while there are systematic patterns of job reallocation over the business cycle, the picture is far from symmetric: U.S. studies have typically found that there is strong cyclical asymmetry in the sense that, over the business cycle,

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ment protection. One part of the Italian story may be the skewed size distribution of employment toward small employers where such legislation applies only to a limited extent. Another reason may be that the Italian data suffer from "spurious" entries and exits. For further details on the influence of both factors on the magnitude of job flows, see below.

job destruction varies much more than job creation. This implies that booms (recessions) are times of low (high) job destruction rather than high (low) job creation. Finally, previous studies have also found that job creation and job destruction are highly persistent.

Our findings suggest that Austrian job turnover is substantial and comparable in size to reallocation rates in the U.S. This means that, during the period 1978-1998, on average 9 out of 100 randomly selected jobs in the private sector were created within the last year, and about 9 out of 100 jobs were destroyed within the next year. Also in Austria, job flows are dominated by idiosyncratic shocks. Aggregate shocks are quantitatively much less important. Contrary to the U.S. evidence, however, we find that the cyclical behavior of job creation and destruction is symmetric. Roughly speaking, upswings are due to both increases in job creation and reductions in job destructions and vice versa for slumps.

Concerning structural determinants we find that there are strong differences in job turnover across firm size categories. Small firms create a lot of jobs, but also a great fraction of jobs is lost by small businesses. As Austrian firms are on average much smaller than U.S. firms, the astonishing similarity of Austrian and U.S. job flow rates could be explained by a simple composition bias. A further important structural determinant of job flows is the age of a firm. Young firms have higher job creation and destruction rates and these rates decrease monotonically with the age of the firm. This suggests that job turnover is to a larger extent a small business phenomenon concentrated among start-ups. These jobs are typically more uncertain and last less long than jobs in larger and more established firms. Finally, there is some evidence of differences in job reallocation across industries but not of important differences across regions.

The paper is organized as follows. Section 2 discusses measurement issues, a problem that is typically present in administrative data of the type used here. The particular issue is to minimize measurement error stemming from administrative changes in the employer identifier as opposed to real deaths and/or start-ups. Section 3 first shows descriptive statistics on the size distribution of firms and employees (across size classes and industries). We then proceed by presenting our main evidence on job creation and destruction in Austria over the period 1978 to 1998 and compare this evidence with results from other countries. We also focus on cyclical properties and persistence of job creation and destruction over time. Section 4 discusses structural determinants of job flows in Austria in more detail. Section 5 summarizes our main results.

2. Data and measurement issues

2.1. Source and coverage

We use employment records from the Austrian social security office *(Hauptverband der österreichischen Sozialversicherungsträger)*. These data cover the universe of employees in the Austrian private-sector (blue-collar, white-collar workers, and apprentices). In addition, all public sector workers that are non-tenured are included. The data set covers the period of January 1972 to December 1998. For the purpose of the present paper, we concentrate on the period 1978 to 1998. The reason for excluding the years from 1972 to 1976 is the higher likelihood of measurement errors. Data for these years show unusually high volatility, most likely due to inconsistencies in the employer files in the early stage of computerization. All employment observations refer to May 10 of each year.

Total employment in the dataset rises from about 2.3 (1978) to 2.6 million (1998). These numbers represent approximately 83% of total employment (not only tenured public sector workers, but also the self-employed are not covered). The empirical analysis below concentrates on the private sector. Hence we excluded all sectors with a substantial share of civil servants (where a change in employment figures might reflect a change in the legal status of employees). The following industries were excluded from the analysis: public sector (public administration, social security administration, military), health services, and transport. Furthermore we excluded all employers with lacking information on industry affiliation. Employment in the cleaned data set roughly equals 1.8 million both in 1978 and 1998, and covers approximately 58% of total dependent employment in 1998.[2]

Establishments are identified using the employers' social security account number. Due to classification changes for administrative purposes, there is potential measurement error in this variable, a problem prevalent in most social security data. Particular care is taken to avoid such classification errors (see below). Furthermore, we cannot distinguish between the plant and the enterprise level as some employer units report (and have corresponding identifiers) for each plant separately, whereas others report all employment in the various plants under a single employer social security number. Hence, an 'establishment' in our analysis is a mixture

of plants and firms (several accounts belonging to the same firm cannot be linked.) This has to be kept in mind when comparing our results to other studies, by construction, measured job flows are higher in plant level-data as opposed to firm-level data, because the latter hides intra-firm movements.

The dataset contains the following employer characteristics: industry affiliation, firm size, region, and firm age. Due to a change in industry classification during our observation period, we grouped employers into 12 broad sectoral groups.[3] Table 1 shows the distribution of employment and establishment over these 12 sectors as well as over 9 different size classes.

Table 1

Almost 70 percent of all establishments in our data set have less than 5 employees, and these establishments employ 13.7 percent of the workers. On the other end of the scale, less than 0.2 percent of all establishments employ more than 500 workers, and these establishments employ 13.2 percent of all workers. The right panel of Table 1 shows the distribution of firms and workers across sectors. For instance, 4.4 percent of all firms belong to the metal/machinery industry which employs more than 14 percent of all workers covered in our data implying that average firm size in this industry is relatively high. On the other hand, the hotel and restaurants industry encompasses 13.6 of all firms but only 7 percent of the workers, implying that average establishment size is below average.

Two further important establishment characteristics (not shown in Table 1) are firm age and firm location. The regional variable in the original data is the local district which was aggregated to nine different regional district types (Palme, 1995). Lacking information on the formation of establishments, their minimum age is calculated as the time difference between its current observation and its first observation (since January 1972).

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[2] Note that employment remains roughly unchanged over the analyzed period. This reflects the fact that much of employment growth has taken place in the public sector. See Stiglbauer (2003) for a more detailed description of the dataset.

[3] Sectoral classification until the early 1990s was accomplished with the 2-digit Austrian classification scheme *(Betriebssystematik 1968)*. Since then, more detailed (6-digit) *ÖNACE* classification labels were attached. Unfortunately, both classification schemes overlap in many respects.

2.2. Classification of entries and exits

Many administrative datasets used for calculations of labor flows suffer from measurement error. There are "spurious" entries and exits of employers from administrative changes in the establishment identifier thereby adding "artificial" labor flows. (For instance, establishments are given a new identifier when changing municipality, or because of mergers and dispersals.) To overcome this problem, we use a classification method which was recently applied to a comparable Swedish dataset (Persson, 2000). Using information on employees' identities, this procedure checks whether a "substantial" part of the workforce of an entering establishment can be found conjointly in the preceding period in another establishment or of an exiting establishment in the follow-up period. If there is a strong personal overlap, we conclude that an entry (exit) is not due to a birth (death) but to a *merger*, a *dispersal*, or a *continuation*.[4]

Continuations (two different establishment identifiers presumably representing the same employer) clearly reduce calculated labor flows as compared to calculations where all entries and exits are treated as births or deaths. Cases identified as continuation also serve for corrections of establishments' age and for calculations involving longer-term longitudinal links (persistence measures, see below). Cases identified as mergers and dispersals are difficult to interpret: They may be due to "true" mergers or splits of companies, but they may also be the result of uniting or splitting social security accounts.

3. Results

3.1. Definition of job flow measures

We shall use the standard definitions of job flow measures as given in Davis and Haltiwanger (1999): *(Gross) Job Creation* in period t equals the sum of employment gains over all growing or entering establishments between t-1 and t. Similarly, *(Gross) Job Destruction* in period t equals the sum of employment gains over all contracting or exiting establishments between t-1 and t. It follows that net employment change is the difference between job creation and

[4] The correction procedure used in this paper applies a critical share for the worker intersection of 0.7 both with respect to the origin and the destination establishments. As it will be shown below, this leads to a reduction of total job reallocation by 1.3 percentage points. Sensitivity analyses show that the results do change not substantially when a lower critical share is applied: Reducing this intersection value to 0.5 (the value used by Persson) would reduce total job flows by further 0.3 percentage points. A detailed discussion of the issues and of solution

destruction. *(Gross) Job Reallocation* equals the sum of job creation and destruction. More formally, consider the net change of employment in establishment *e* in the subset of establishments *s* (which could be a sector, a size class, or a region) between the sampling dates in *t* and *t*-1: $\Delta EMP_{est} = EMP_{est} - EMP_{es,t-1}$. Job creation is the sum of employment changes of all establishments (expansions and new entries) with employment gains (represented by S^+):

$$C_{st} = \sum_{e \in S^+} \Delta EMP_{est}$$

Similarly, job destruction is the sum of employment changes within those establishments exhibiting job losses (contractions and exits, represented by S^-):

$$D_{st} = \sum_{e \in S^-} \left| \Delta EMP_{est} \right|$$

Total Job Reallocation is the sum of job creation and destruction, whereas net employment change is the difference of both rates. Finally, *Excess Job Reallocation* equals the difference between job reallocation and the absolute value of net employment change, representing that part of job reallocation over and above the amount required to accommodate net employment change.

$$\begin{aligned} R_{st} &= C_{st} + D_{st} \\ G_{st} &= C_{st} - D_{st} \\ X_{st} &= R_{st} - \left| G_{st} \right| \end{aligned}$$

To express the job flow measures as rates they are divided by average employment Z_{st} where $Z_{st} = 0.5\left(EMP_{st} - EMP_{s,t-1}\right)$. Hence (using lower case letters for the rates):

$$c_{st} = \frac{C_{st}}{Z_{st}}, d_{st} = \frac{D_{st}}{Z_{st}}, r_{st} = \frac{R_{st}}{Z_{st}} \text{ and } g_{st} = \frac{G_{st}}{Z_{st}} \text{ whereas } x_{st} = r_{st} - \left| g_{st} \right|$$

It is important to recognize that job flow rates c_t, d_t, r_t, g_t for the whole population of employers are averages of their subset values, weighted by the subsets' average employment as a fraction of total average employment. Ultimately, aggregate job flow rates can be calculated

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methods can be found in OECD (1996). Margolis (2000) used a similar technique to distinguish "false" from "true" firm deaths.

as size-weighed means of individual establishments' growth rates with average employment as the denominator. (This property does not hold for excess job reallocation.)

3.2. Magnitude of job flows

To our knowledge, Hofer et al. (2001) are the first who calculated job flow rates for Austria. However, their scope was limited, as they used two rather small samples of continuing firms in the market sector (so they were not able to measure the extent of firm entries and exits on job flows). Also, their period under consideration was quite short (1990 to 1994).[5]

Figure 1 shows how job creation and destruction evolved over the period 1978 to 1998. As shown by the upper line in Figure 1, job reallocation is relatively high: By the end of the 1990s the job reallocation rate amounted to about 20 percent, equally divided between job creation and job destruction. This means that, on average, 9 out of 100 jobs have been created within the last year; and about 9 out of 100 jobs disappear in a given year. These numbers reflect the fact that employment changes are due to the fact that firms are subject to idiosyncratic risks. In contrast, aggregate shocks appear to be of smaller quantitative importance. The standard deviation of aggregate employment growth (as a rough measure of the magnitude of aggregate employment shocks) amounts to about 1.2 percent of total employment (see Table 2). Total net employment growth in our private sector sample was zero over the period under consideration.

Figure 1

Another interesting result in Figure 1 is the steady increase in job reallocation since the mid 1980s. In 1986 the total reallocation rate amounted to about 16 percent, was gradually increasing thereafter, and reached 20 percent in 1996. The same time trend shows up for both job creation and destruction. Table 2 gives the magnitude of Austrian job flows together with a comparison with Sweden, Germany, Italy and the U.S. Sweden[6] and Germany are of particular interest, as these countries have similar (corporatist) labor market institutions with a high degree of employment protection and a strong voice of unions in the employment deci-

[5] Our results for the period 1990-1994 (and limited to continuing firms) yield similar rates as Hofer et al. (2001). Huber et al. (2002) report job flow numbers for Vienna (1996 to 1999), also based on social security data. See Stahl (2000) for a first exploratory analysis of job flows with the dataset used here.

[6] Moreover, the Swedish data were cleaned with the same classification procedure for firm deaths and births.

sions of firms.[7] This comparison, thus, allows checking for a specific Austrian pattern. The U.S. model of a flexible labor market (i. e. characterized by high dynamics) can serve as a benchmark case.

Table 2

The Austrian results on job flows are comparable to the other countries. The corrected rate of job creation (Column 2) amounts, on average over the observation period, to 8.9% per year. This is higher than in Germany and almost identical to the one of the U.S. However, it is somewhat lower than results from Sweden (11.2%) and Italy (11.9%). The overall picture of job destruction is very similar. Contrary to prior expectations, Austrian job reallocation is close to the average, strong regulations do not show up in the job turnover data. One reason may be that U.S. data refer to manufacturing only, whereas Austrian data (and the data of the remaining countries displayed in Table 2) include almost the entire (manufacturing and non-manufacturing) private sector. Hence industry composition may play an important role here. This is especially relevant as far as the Austrian data are concerned, where sectors with potentially high-turnover– like tourism and construction – are strongly represented. A further interesting difference between Austrian and U.S. data refers to the volatility of job creation and destruction measures. The standard deviation of these variables is up to three-times as large in the U.S. as compared to Austria. Moreover, the standard deviation of aggregate employment growth is 1.2 (as compared to the U.S. where the corresponding figure is four times as large). In the other countries covered in Table 2, the volatility of job creation and destruction is comparable to Austria and smaller than in the U.S.

An interesting extension decomposes job creation into those parts related to new entries of firms and expansions of existing enterprises. Approximately two thirds of new jobs are created in existing firms, whereas one third of new jobs are created in start-up firms. Here, the proper adjustment for spurious classification changes in our data – getting rid of false entries and exits – is clearly important. To see this compare the first (unadjusted) and second (adjusted) column in Table 2. The unadjusted measures of Column 1 give a much higher number of job creation for start-ups. Among the category of new entrants, the bulk of job creation arises from firm births – as compared to dispersals and mergers of existing firms. Likewise

[7] Results for Germany are based on a very similar sectoral coverage.

for job destruction: two thirds of jobs are lost in contracting, but surviving firms, whereas only one third of the job loss is the result of firm deaths.[8]

3.3. Job flows over the business cycle

How does job creation and destruction behave over the business cycle? A naïve macro view – starting from a representative agent / representative firm framework – might assume that in a recession jobs are destroyed and in a boom jobs are created. However, we have already seen in Figure 1 above that both job creation and destruction never become zero. In contrast, a lot of job creation takes place during a recession – the job creation rate never fell below 8 percent over the analyzed period. Similarly, a large fraction of jobs is destroyed even in a boom – the job destruction rate never fell below 7 percent.

Nevertheless, Figure 1 shows a clear cyclical pattern in creation and destruction rates. During times of high GDP growth and high employment growth we see also high rates of job creation whereas during such periods job destruction rates fall below normal. Exactly the opposite pattern – low job creation and high job destruction – occurs during times when GDP and employment grow unusually slowly.

Table 3

Table 3 displays these cyclical relationships more systematically and shows Pearson correlations of various job flow rates with the net employment change rate and with GDP growth. All correlations in Table 3 have the expected sign and most of them are significantly different from zero. Moreover, there is a closer association between gross job flows and net employment growth as with GDP growth. Job creation is slightly stronger correlated with the business cycle than job destruction.[9] Moreover, we see from Table 2 that the standard deviation of job creation and job destruction is of about equal size (0.9 for both job creation and job destruction, see the adjusted data of Col. 2 in Table 2). This is different from the U.S. where job creation fluctuates less strongly than job destruction (with standard deviation 2.1 for job crea-

[8] It should be noted, though, that many contracting firms might go bankrupt in a year or two, their job losses are coded as those of contracting firms.

[9] See also Figure 1 for a visual impression.

tion, and 3.1 for job destruction, see last column in Table 2).[10] The most plausible reason for this lack of asymmetry is that, unlike in the U.S. – where firing costs and employment protection are much lower – it is much more difficult and more costly to decrease employment in Austria. The process of job destruction takes more time and is more costly and hence spreads out over more periods resulting in a lower volatility of job destruction rates. Given this symmetry between job creation and destruction over the business cycle it is not surprising that we do not find any cyclicality in job reallocation (creation *plus* destruction) rates. This finding is in contrast to theories of higher turbulence in recessions reviewed in Davis et al. (1996).

Considering the still high correlation between job flows and the business cycle, it is important to distinguish between job flows initiated by existing firms and those by firm turnover. The results in Table 3 clearly reveal that entries and exits are far less cyclical than expansions and contractions of existing firms. These results can be understood by a transactions costs view: it is much more risky to start (and much more costly to close) a firm as compared to simply hiring and firing marginal workers. Interestingly, as far as the correlation between job creation and destruction rates is concerned we find a small (but insignificant) positive correlation for yearly data. This is mainly due to that both job creation and destruction show the same upward trend. Using quarterly data, there is a relatively high negative correlation of –0.7 between these two variables (results are not shown in Table 3). This reflects of the strong seasonal fluctuations of the Austrian labor market, which is also apparent in "non-seasonal" sectors like manufacturing.

3.4. Persistence of job flows

The high job turnover rates suggest that the Austrian labor market is as flexible as the U.S. This proposition has to be qualified in two respects. First, job flows yield only limited information on the flow of workers in and out of employment and between jobs. Rather, job flows are a lower bound for workers flows: a firm that does not create any jobs may nevertheless have in- and outflows of workers, that is high 'churning' (Burgess et al., 2000). Second, job flows as measured above are informative on the probability that jobs have either been recently created or will be destroyed in the near future. However, it is less clear from these measures

[10] Caballero and Hammour (1994) explain U.S. evidence in a model where recessions are times of restructuring. Technical change decreases prices over time causing contractions and shutdowns in firms that are technologi-

how long jobs that are created today will survive; and whether jobs destroyed today will be recreated in the future. The question is whether we measure short-lived labor market fluctuations or a long-lasting reallocation of job opportunities.

This paper is concerned with job rather than worker flows, so an analysis of the incidence of churning is beyond the scope of this paper. In the following we will concentrate on the persistence issue. Obviously, studying the persistence of current job creations and destructions yields important additional information on the quality of job flows. Obviously, it makes a difference if all job creations and destructions are immediately reversed in the next period, as opposed to a situation where job flows are of high persistence. In the former case, the size of a given firms fluctuates around a given level, little change in the overall distribution of firms. In case of high persistence, changes in employment last over long periods leading to systematic changes in the distribution of firms.

In Table 4 we present persistence rates of job creation and destruction (see also Davis et al. 1996): The *N-period persistence of job creation* is the percentage of newly created jobs at date t that survives up to date $t+N$. To make things precise, consider a firm with employment size *EMP* at date t and suppose this firm has created a job in period t. We say this newly created job persists for x years if employment does *never* fall below *EMP* throughout the time period $(t, t + x)$. Similarly if a firm with employment *EMP* has destroyed a job in period t we consider this job destruction as persisting for x years if employment never reaches the level *EMP* again throughout the period $(t, t + x)$. Note that this concept – like job creation and destruction measures itself – does not consider worker flows, and treats all jobs within the firm as homogenous.

Table 4

Table 4 shows that job creation as well as job destruction are highly persistent. Given 10 jobs created now in a specific firm, 7 are still around in the firm after one year, 4 are still around after five years and almost 3 still exist after a period of 10 years. Job destruction is even more persistent: after one year, 8.4 out of 10 destroyed jobs do not re-appear; after 10 years only one third of the destroyed jobs re-appear in the original firm. To relate our results to Davis et al. (1996): Austrian job creation and destruction seem to be slightly more persistent: E. g. our

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cally not competitive. A recession also decreases demand causing bunching of shutdowns and contractions dur-

2-year persistence of job creation is 57.4 percent (54.4 percent in the U. S.). The 2-year persistence of job destruction in Austria is 77.9 percent (as compared to 73.6).[11]

A quick look at the composition of job destruction – contractions of existing firms and firm deaths – shows that two different things are compared here: if a job in a dying firm is lost, it is so forever; because the firm does not exist any more by definition. Hence a more suitable exercise is to compare the persistence of job creation and destruction in existing (expanding and contracting) firms. Persistence rates of contracting firms are lower by definition, but are still relatively high. Job destructions continue to be more persistent than job creations when only existing firms are regarded. Whereas six out of 10 lost jobs are still lost after 10 years, this compares to a 10-year persistence of less than three out of 10 currently created jobs.

The most interesting message of Table 4 is that the stability of jobs created in new-firms is not dramatically different from the stability of jobs created in already existing firms. Even after 10 years almost a quarter of all job created by start ups are still around. Hence start-ups provide almost as stable jobs as existing firms that create jobs. This evidence is striking, given that in general start-up firms are associated with high but unstable job creation.

4. Structural determinants of job flows

There are sizeable sectoral differences in job flow rates. Figure 2 shows average annual job creation and destruction for 12 sectors. Manufacturing sectors – represented by triangles – show both comparably low job creation and destruction rates. Moreover, they are all above the diagonal line, i.e. they exhibit negative employment growth in the whole period, especially textiles and clothing. Most service sectors – represented by circles – have relatively high job reallocation rates, with the notable exception of banking and insurance. The primary sector – represented by squares – is polarized: very high job reallocation in agriculture and forestry, but very low reallocation in the energy and mining industry – partly because this sector is very capital intensive and also heavily regulated.

Figure 2

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ing recessions.

[11] Due to the construction of their dataset, Davis et al. are not able to compute persistence measures with a longer time horizon.

Most of the discussion of establishment-level heterogeneity of job flows in the literature is based on one-way ore two-way tabulations of job flow rates over different characteristics of establishments (such as age, size, sectoral or regional variables). But of course interdependencies between variables may result in wrong conclusions. Sometimes, the between-within-sector decomposition of job reallocation (see Davis and Haltiwanger, 1999) is applied to investigate whether structural shifts within cells (in general industries) are responsible for the high job flows. Surveying this kind of exercise, Davis and Haltiwanger dismiss the structural shift hypothesis: only between 0 and 20% of job reallocation could be explained by structural shifts between industries. Of course, any such exercise depends on a somewhat arbitrary choice of sector. Moreover, structural shifts can happen not only between sectors; other factors like regions firm size, etc. will also play a role, factors which should also be taken into account.

In the following, we try to analyze job flows within a regression framework.[12] We aggregated our data to cells, constructed as follows: Pooling observations for 16 years[13], we calculated job flow rates for cells according to 9 regional district types, 12 sectors, 9 size classes and 6 firm age categories (whereby observations of newly created establishments were dropped)[14]. To avoid the regression-to-the-mean bias, size was defined as current size (the average of employment in *t* and *t*-1), which is also the regression weight given to each observation.[15] For all years, this leads to a maximum of 93,312 cells, of which more than 44,000 were actually existent (i. e. containing at least one firm with one employee in *t* or *t*-1).[16] Dependent variables are the total job reallocation rate, the job destruction rate, the job creation rate of expansions and the job destruction rate of contractions. The explanatory variables are a set of dummy variables for each of the above mentioned cell characteristics, including year dummies to capture

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[12] Usual regression analysis has barely been used in this large literature, with the exception of Contini et al. (1996) and Davis and Haltiwanger (1999); both these papers do not discuss conceptional issues or present and discuss their results.

[13] We disregard the first five years to be able to use the information about firm age.

[14] The handling of establishment births is a conceptional problem. Cells in this youngest age category show a job creation (job reallocation) rate of 2.0 by definition. Due to this perfect collinearity these cells have to be omitted.

[15] Due to weighting, regression coefficients would be identical if individual establishments' growth rates were used as the dependent variables instead of cell outcomes. (However, some measures like excess reallocation are not defined at the firm level.)

[16] Bearing in mind that there are roughly 1.8 million employees and 200,000 establishments in each year, a cell contains about 649 employees and 72 establishments on average.

trend, cycle and institutional changes over time. To control for remaining heteroscedasticity, consistent standard errors were calculated with the Huber/White/sandwich estimator.

Table 5

Results in Table 5 show the overwhelming importance of firm size and age. These two indicators dominate the variation in job flows clearly. Total job reallocation as well as job destruction (columns (1) and (2)) almost monotonously decline with firm size. Firms with more than 250 workers have a job reallocation rate 20 percentage points lower than small firms with less than 5 employees. Even if one considered the data for very small firms somewhat shaky – because of possible problems with detecting "spurious" entries and exits – the job reallocation rate is still considerably higher for medium-sized firms as compared to big firms. Is job reallocation larger in small firms, because these firms grow more? This is not the case. For excess reallocation – which considers different net employment growth by firm size – there is a very similar, albeit slightly smaller size-job-flow relation (results not shown in Table 5). As age of the firm is also controlled for, the size-job-flow relation is not caused by the correlation between age of the firm and firm size. Several reasons can account for this picture: larger firms with many product lines and many sales regions can shield or insure themselves more easily against sectoral shocks. They can also shift jobs from one unit to the other without changing the actual firm size.[17] As we disregard new firms, job creation is measured for expansions only. Results from cols. (3) and (4) for expanding and contracting firms show that the main firm size effect stems not from hiring and firing in existing firms, but from small dying firms. Job creation (from expansion) as well as job destruction (from contractions only) show a considerably less pronounced size pattern.

Age of the firm has a comparably big impact on job flows. Job reallocation rates of young firms – below 3 years – are more than 20 percentage points below those of older firms. These results are in line with the passive-learning model by Jovanovic (1982). Interestingly, young firms are very active in terms of job creation, but for job destruction firm age is far less important. The other control variables have a smaller impact on job flows. In terms of sectors, the highest job reallocation happens in the construction, textiles and the hotel and restaurant industry, the lowest in traditional service sectors like banking, insurance and other private

[17] See Idson (1996) and Winter-Ebmer (2001) for similar arguments concerning worker turnover and firm size.

services. Regional differences are less important. Most of the time dummies are significant and show increasing values, especially in the 1990s which indicates rising dynamics in the Austrian labor market.

Given that firm size effects are very important and the size distribution of U.S. and Austrian firms is very different, it makes sense to investigate if the relatively similar aggregate job flow rates in Austria and the U.S. (Table 2) are simply caused by a composition bias. To make a meaningful comparison, we concentrate on manufacturing establishments and calculate job creation and destruction rates in various size classes comparable to Davis et al. (1996, Tables 4.2 and 2.1). As Davis et al. look only at the period 1973- 1988, we use the period 1978-1988 for Austria. As the Austrian data cannot strictly differentiate between plants and establishments, we use for the U.S. the more conservative – smaller - measures for plant size (as opposed to firm size).

Table 6

Table 6 clearly shows that Austrian job flow rates are substantially smaller than the corresponding rates for the U.S. for all firm size categories. For instance, U.S. firms with more than 250 workers have turnover rates two to four times the Austrian rates. For lower size classes the country-differences are smaller in relative terms but very large in absolute value. For instance, job reallocation in firms with less than 20 employees is 42% in the U.S. but less than 25% in Austria, although the smallest plants are excluded from the data Davis et al. (1996) use. The average job creation rate in the manufacturing sector was 8.8% for the U.S. and 5.8% for Austria (over the period 1978-1988), for job destruction the corresponding figures are 10.4% for the U.S. and 7.1% for Austria. Hence, Austrian manufacturing job flows are considerably smaller as compared to job flows for the total economy.

An obviously interesting question is the following: How would Austrian job flow rates look like if Austria had the same size distribution of firms as the U.S. after adjustment for the sectoral coverage? Evaluating the Austrian job flow rates using weights of the American firm size distribution leads to a job creation rate of 4.3% and a destruction rate of 5.6%, which are

almost exactly half of the U.S. figures.[18] This indicates that the Austrian labor market is far less turbulent than the American one.

5. Summary and conclusions

Job turnover is substantial in Austria. Over the period 1978-1998, on average, 9 out of 100 randomly selected jobs were created within the last year, and about 9 out of 100 randomly selected jobs were be destroyed within the next year. Aggregate shocks are quantitatively much less important. This is reflected in lower standard deviations of job flow rates and the rate of net employment growth. This suggests that observed job flows in the labor market are primarily driven by idiosyncratic shocks. Job creation strongly increases during upswings and decreases during downturns: the correlation between GDP growth and job creation is 0.5 and the correlation between the aggregate employment growth rate and job creation is 0.7. For job destruction, the corresponding correlations are –0.6 and –0.5. Contrary to many other studies, which have found large cyclical changes in job destruction and small cyclical changes in job creation no such systematic asymmetries show up in the Austrian data. Furthermore, we find substantial persistence, both in job creation and job destruction: the probability that a job created within the last year survives for at least 5 years is about 40%.

Job turnover rates differ strongly by firm size. The job reallocation rate in firms larger than 1,000 employees is nearly 25 percentage points lower than the corresponding rate for businesses with less than 5 employees. This suggests that job turnover is to a larger extent a small business phenomenon. We also find a considerable effect of a firm's age on the amount of job reallocation. Job reallocation rates of firms in their second year after start-up have a reallocation rate that is 40 percentage points higher than firms that have been started more than 10 years ago. There is considerable raw variation in job reallocation rates by industry. However, taking firm size and age constant, reduces the differences between industries to a large extent. This reinforces the fact, that firm size and firm age are the prime factors influencing job flows.

[18] It should be noted that the periods considered for both countries differ: U. S. results for size classes are only available for the period of 1973-88 whereas for Austrian manufacturing the period 1978-88 is used. However, the U. S. data show very high and turbulent job flow rates in the 1970s , so this reinforces only our conclusion that Austrian job reallocation is considerably lower than in the U. S.

Aggregate studies often claim that job turnover in Europe was comparable in size to that in the U.S. For the case of Austria, this seems to be a gross overestimation. If job reallocation is measured on an equal footing in terms of industry classification and firm size composition, Austrian rates are only half the rates for the U.S. The results from the persistence of once created (or destroyed) jobs point in the same direction: jobs in one firm do not appear in one year and disappear in the next, but jobs once destroyed remain dead, those once created live relatively long. These results indicate a strong impact of regulation and labor law on job turnover.

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Table 1: Distribution of firms and employment: size classes and sectors (1998)

size classes	establishment share (%)	employment share (%)	broad sectoral groups	establishment share (%)	employment share (%)
employment < 5	69.9	13.7	agriculture and forestry	3.3	1.5
5 ≤ employment < 10	14.9	10.9	mining, energy, and water	0.4	2.2
10 ≤ employment <20	7.9	11.9	food, beverages, tobacco	2.6	4.0
20 ≤ employment < 50	4.5	15.4	textiles clothing	1.2	2.3
50 ≤ employment < 100	1.5	11.3	wood and paper	4.5	6.6
100 ≤ employment < 250	0.9	15.0	chemical products	1.4	4.6
250 ≤ employment < 500	0.2	8.6	metal and machinery	4.4	13.2
500 ≤ employment < 1,000	0.1	6.6	construction	9.3	14.3
employment ≥ 1,000	0.0	6.6	wholesale and retail trade	28.0	24.8
			hotel and restaurant	13.6	7.0
			banking, insurance, real estate	1.4	5.0
			other private services	29.8	14.5
Total (absolute figures)	**100.0** (199,285)	**100.0** (1,775,161)	**Total** (absolute figures)	**100** (199,285)	**100** (1,775,161)

Table 2: Magnitude of Austrian job flows and comparison with selected studies from other OECD countries

	Country (period)											
	Austria [a] (1978-98)		Austria [b] (1978-98)		Sweden [c] (1987-95)		Germany [d] (1977-89)		Italy [e] (1984-93)		United States [f] (1973-88)	
Job flow rate	Mean	(Std. Dev.)	Mean	(Std. Dev.)	Mean	(Std. Dev.) [i]	Mean	(Std. Dev.) [i]	Mean	(Std. Dev.)	Mean	(Std. Dev.)
Job Creation	**9.6**	**1.0**	**8.9**	**0.9**	**11.2**	**1.2**	**8.5**	**1.0**	**11.9**	**n. a.**	**9.1**	**2.1**
Entries	3.9	0.6	3.1	0.5	-	-	2.3	0.2	3.8	n. a.	-	-
Births			2.2	0.3	1.8	0.2	-	-	-	-	1.4	n. a.
Dispersals and mergers			0.9	0.3	n. a.	-	-	-	-	-	-	-
Expansions	5.8	0.5	5.8	0.6	9.4 [h]	1.1	6.2	0.9	8.1	n. a.	7.7	n. a.
Job Destruction	**9.6**	**0.9**	**8.9**	**0.9**	**12.1**	**2.4**	**7.5**	**0.9**	**11.1**	**n. a.**	**10.3**	**3.1**
Exits	3.7	0.5	3.0	0.4	-	-	1.7	0.2	3.7	n. a.	-	-
Deaths			2.3	0.3	1.7	0.3	-	-	-	-	2.4	n. a.
Dispersals and mergers			0.7	0.2	n. a.	-	-	-	-	-	-	-
Contractions	5.9	0.5	6.0	0.6	10.4 [h]	2.2	5.8	0.8	7.4	n. a.	7.9	n. a.
Job Reallocation	**19.2**	**1.5**	**17.9**	**1.3**	**23.3**	**1.7**	**16.0**	**0.6**	**23.0**	**1.6**	**19.4**	**2.1**
Net Employment Growth	**0.0**	**1.2**	**0.0**	**1.2**	**-0.9**	**3.5**	**0.9**	**1.7**	**0.8**	**n. a.**	**-1.1**	**4.8**
Excess Job Reallocation	**18.3**	**1.6**	**17.0**	**1.4**	**20.7 [i]**	**1.3**	**14.3 [i]**	**0.8**	**n. a.**	**n. a.**	**15.4**	**2.0**

Notes:

[a] Our own results without classification procedure. Sectoral coverage: All sectors, excluding public sector, health services, transport, and establishments without sectoral label. Data: Social Security Records *(Hauptverband der österreichischen Sozialversicherungsträger)*. Employer unit: Establishments.

[b] Our own results after application of classification procedure and correction for continuations.

[c] Source: Persson (2000). Sectoral coverage: All sectors, excluding construction, including the self-employed. Data: Swedish Business Register. Employer unit: Establishments.

[d] Source: Boeri and Cramer (1992). Sectoral coverage: All sectors, excluding public sector, postal services, railways, and agriculture. Data: social security records *(Bundesanstalt für Arbeit)*. "Spurious" entries and exits are included. Employer unit: Establishments.

[e] Source: Contini et al. (1995). Sectoral coverage: All private firms. Data: social security secords *(Istituto Nazionale Previdenza Sociale)*. Employer unit: Firms. The data suffer from the inclusion of "spurious" births and deaths. But the authors report that efforts similar to the correction procedure applied by Persson (2000) and us would reduce total gross job reallocation by about one fifth.

[f] Source: Davis et al. (1996). Sectoral coverage: Manufacturing. Data: Longitudinal Research Database, based on the Census of Manufactures and the Survey of Manufactures. Due to the careful construction of the dataset, entries (exits) may be interpreted as genuine births (deaths). Employer unit: Plants.

[g] Persson's results before the application of the classification procedure are 3.5% and 3.1% for entries and exits, respectively.

[h] Figures include dispersals and mergers.

[i] Our own calculations, based on authors' reported annual results.

Table 3:Annual job flow rates: Pearson correlations with cyclical measures [a)]

Job flow rate X_t	$\rho(X_t, g_t)$ [b)]		$\rho(X_t, y_t)$ [c)]	
Job Creation	0.714	(0.000)	0.489	(0.025)
Entries	0.353	(0.116)	0.229	(0.318)
Expansions	0.911	(0.000)	0.636	(0.002)
Job Destruction	-0.612	(0.003)	-0.494	(0.023)
Exits	-0.264	(0.248)	-0.388	(0.082)
Contractions	-0.743	(0.000)	-0.466	(0.034)
Job Reallocation	0.121	(0.600)	0.036	(0.876)
Net Employment Growth	1.000		0.738	(0.000)
Excess Job Reallocation	0.121	(0.603)	-0.185	(0.422)

Notes:
[a)] *p* values in parentheses.
[b)] g_t denotes the net employment growth rate of the establishments used in calculation of the reported job flow rates.
[c)] y_t denotes the weighted average of the GDP growth rate in year *t* and *t-1* (with weights 5/12 and 7/12, respectively).

Table 4: Average annual persistence rates of job creation and job destruction (percent)

Persistence of	after *N* years									
	1	2	3	4	5	6	7	8	9	10
Job Creation	70.7	57.4	49.2	43.6	39.6	36.5	33.9	31.8	29.6	27.6
Expansions	71.0	58.0	49.8	44.4	40.5	37.4	34.9	32.8	30.5	28.6
Births	69.8	55.7	47.0	41.1	36.8	33.6	30.8	28.6	26.5	24.7
Job Destruction	83.9	77.9	74.6	72.4	70.8	69.5	68.6	67.7	67.1	66.6
Contractions	80.9	73.8	69.8	67.3	65.3	63.8	62.6	61.5	60.7	60.1

Table 5: Employment-weighted robust regressions of job flow rates 1983–98 (cell outcomes)

	Dependent variable			
	(1) Job Reallocation	(2) Job Destruction	(3) Job Creation (Expansions only)	(4) Job Destruction (Contractions only)
Size (base: employment ≥ 1,000)				
Employment < 5	0.229	0.171	0.029	0.041
5 ≤ employment < 10	0.132	0.078	0.054	0.050
10 ≤ employment <20	0.095	0.055	0.041	0.033
20 ≤ employment < 50	0.071	0.040	0.032	0.024
50 ≤ employment < 100	0.051	0.026	0.026	0.015
100 ≤ employment < 250	0.036	0.016	0.020	0.009
250 ≤ employment < 500	0.016	0.004 *	0.012	0.003 *
500 ≤ employment < 1,000	0.017	0.004 *	0.014	0.003 *
Age (base: age > 10 years)				
age = 1 year	0.392	0.139	0.267	–0.003 *
age ≤ 2 years	0.242	0.112	0.125	0.020
age ≤ 3 years	0.160	0.079	0.074	0.025
3 < age ≤ 5 years	0.105	0.046	0.053	0.016
5 < age ≤ 10 years	0.052	0.015	0.034	0.006
Sectors (base: mining, energy, and water)				
Agriculture and forestry	0.027	0.014	0.005 *	0.007
Food, beverage, tobacco	–0.003 *	–0.006 *	0.005 *	0.000 *
Textiles and clothing	0.042	0.042	0.000 *	0.033
Wood and paper	0.011 *	0.001 *	0.011	0.007 *
Chemical products	0.014	0.004 *	0.010	0.006 *
Metal and machinery	0.029	0.018	0.012	0.019
Construction	0.048	0.024	0.025	0.020
Wholesale and retail trade	–0.001 *	–0.011	0.011	–0.001 *
Hotel and restaurant	0.056	0.022	0.025	0.020
Banking and insurance	–0.024	–0.029	0.006 *	–0.026
Other private services	–0.019	–0.033	0.016	–0.012
Regions (base: Vienna)				
Other cities	–0.012	–0.009	–0.003 *	–0.006
Suburban regions	–0.013	–0.015	0.002 *	–0.011
Medium–size towns	–0.018	–0.017	–0.001 *	–0.009
Intensive industrial regions	–0.019	–0.017	–0.002 *	–0.011
Intensive tourist regions	–0.001 *	–0.010	0.003	–0.003 *
Extensive industrial regions	–0.022	–0.022	0.001 *	–0.013
Tourist rural regions	–0.022	–0.026	0.002 *	–0.014
Industrial rural regions	–0.031	–0.029	–0.001 *	–0.017
Constant	0.047	0.051	–0.004 *	0.046
Observations	44,342	44,342	44,342	44,342
Weighted mean of LHS variable	0.157	0.092	0.060	0.061
R^2	0.548	0.393	0.322	0.138

Notes:
Asterisks denote *non*–significance at the 1% level. Results for year dummies are not shown (base 1983). The maximum possible number of cells is 93,312 (16 years × 9 size classes × 6 age classes × 12 sectors × 9 district types) of which 44,342 are non-empty (i. e. it contains at least one establishment with one employee in period *t* or *t*-1). Observations of newly created establishments were dropped (see the text).

Table 6: Job Creation and Destruction in Austrian and U. S. Manufacturing: The Influence of the Size Distribution on Total Job Reallocation

	U. S. Manufacturing 1973 - 1988 [c]			Austrian Manufacturing 1978 - 1988		
Size class [a]	Job Creation	Job Destruc-tion	Employ-ment Share	Job Creation	Job Destruc-tion	Employ-ment Share
Up to 19 Employees [b]	0.187	0.233	0.052	0.116	0.131	0.212
20 to 49	0.132	0.153	0.086	0.072	0.086	0.122
50 to 99	0.122	0.135	0.105	0.060	0.070	0.106
100 to 249	0.096	0.107	0.185	0.050	0.060	0.156
250 to 499	0.077	0.087	0.160	0.033	0.048	0.123
500 to 999	0.070	0.076	0.135	0.034	0.040	0.088
1,000 to 2,499	0.086	0.087	0.123	0.027	0.041	0.093
2500 or more	0.057	0.065	0.154	0.011	0.034	0.100
Total	**0.091**	**0.103**	**1.000**	**0.058**	**0.071**	**1.000**
	1978 - 1988			US size-weighted total [d]		
	0.088	**0.104**	-	**0.043**	**0.056**	**-**

Notes:
[a] Size is defined as the average of employment in *t* and *t* - 1, i. e. the "current size" measure of Davis et al. (1996).
[b] The U. S. manufacturing data (the LRD) do not include plants with less than five employees.
[c] Source: Davis et al. (1996), Tables 4.2 and 2.1.
[d] Total job creation and destruction are calculated as a weighted average of job reallocation rates in size classes, using the US employment shares as weights.

Figure 1: Annual job reallocation

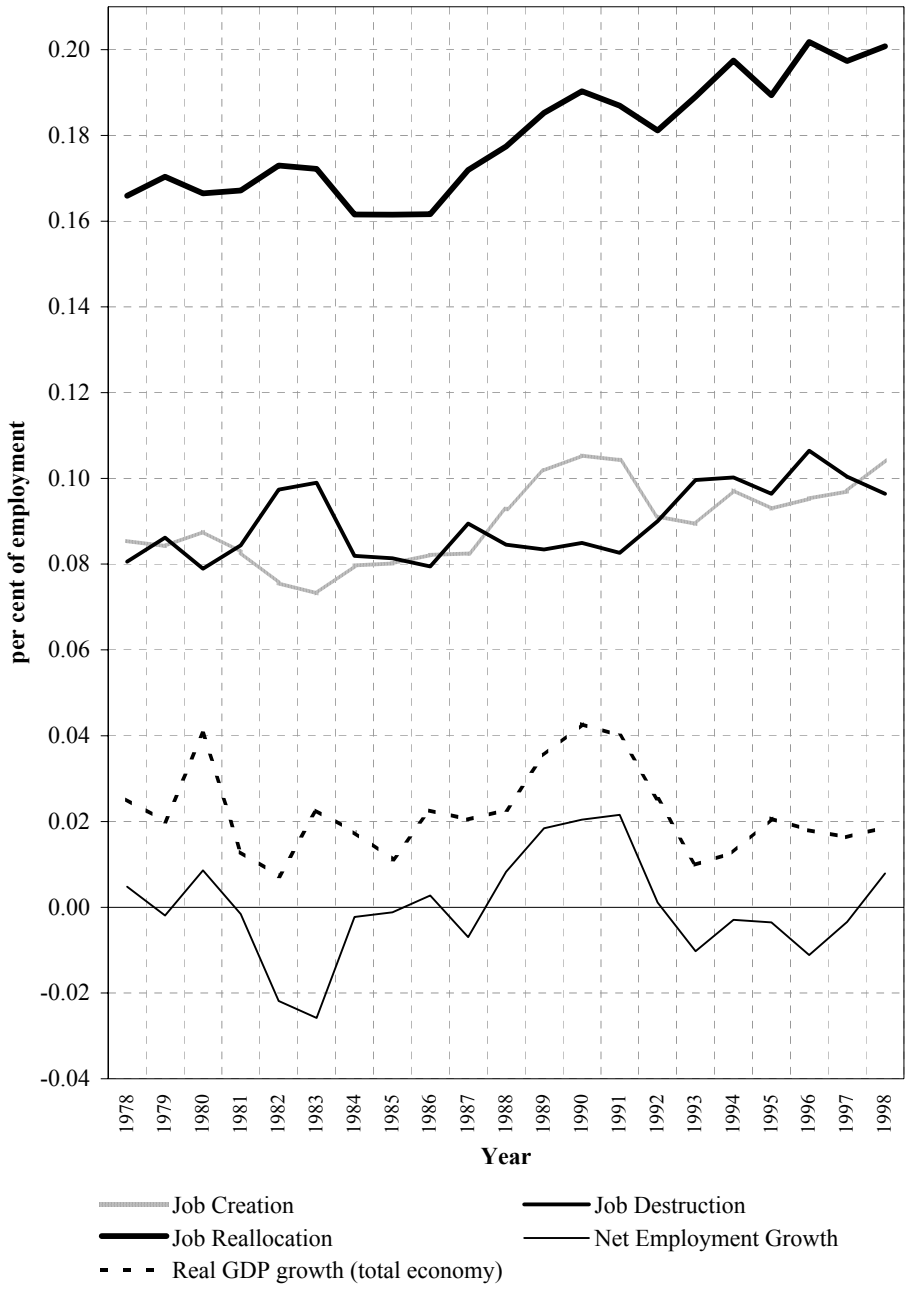
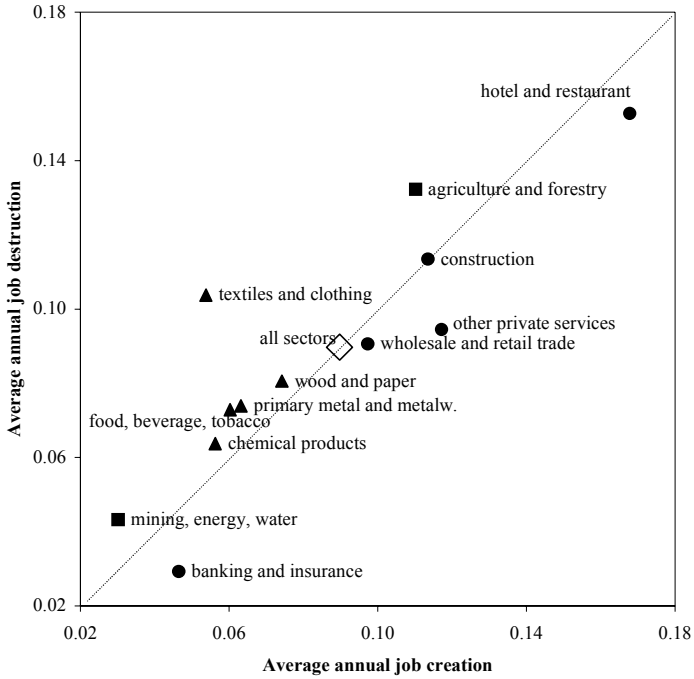


Figure 2: Sectoral job flows



Index of Working Papers:

August 28, 1990	Pauer Franz	1[1)]	Hat Böhm-Bawerk Recht gehabt? Zum Zusammenhang zwischen Handelsbilanzpassivum und Budgetdefizit in den USA[2)]
March 20, 1991	Backé Peter	2[1)]	Ost- und Mitteleuropa auf dem Weg zur Marktwirtschaft - Anpassungskrise 1990
March 14, 1991	Pauer Franz	3[1)]	Die Wirtschaft Österreichs im Vergleich zu den EG-Staaten - eine makroökonomische Analyse für die 80er Jahre
May 28, 1991	Mauler Kurt	4[1)]	The Soviet Banking Reform
July 16, 1991	Pauer Franz	5[1)]	Die Auswirkungen der Finanzmarkt- und Kapitalverkehrsliberalisierung auf die Wirtschaftsentwicklung und Wirtschaftspolitik in Norwegen, Schweden, Finnland und Großbritannien - mögliche Konsequenzen für Österreich[3)]
August 1, 1991	Backé Peter	6[1)]	Zwei Jahre G-24-Prozess: Bestandsaufnahme und Perspektiven unter besonderer Berücksichtigung makroökonomischer Unterstützungsleistungen[4)]
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October 12, 1992	Hochreiter Eduard (Editor)	9[1)]	Alternative Strategies For Overcoming the Current Output Decline of Economies in Transition
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