Compensating Wage Differentials and Seasonal Employment in Austria: Evidence from Administrative Data *

Emilia Del Bono†, Andrea Weber‡

This version
May 4, 2005

Abstract

In this paper we investigate the existence of compensating wage differentials across seasonal and non seasonal jobs, which arise due to working time restrictions. We build on a theoretical model by Abowd and Ashenfelter (1981), which links the compensating wage differential to variation in individual unemployment through the effect of the unemployment insurance system as well as the compensated labor supply elasticity and the coefficient of relative risk aversion. Since the Austrian labor market is characterized by an unusually high share of seasonal employment, our data provides the ideal setting in which to empirically test this model. We use the very rich information contained in the Austrian administrative records to derive a flexible definition of seasonal employment based on observed regularities in employment patterns. We then show that while a positive amount of the wage differential attributed to seasonal employment is covered by the employer, a larger fraction is paid by the unemployment insurance system.

Keywords: seasonal employment, wage differentials, labor supply elasticity, fixed effects panel estimation
JEL classification: J22, J3, C23

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*We are grateful to David Card, Damon Clark, Helmut Hofer and Rudolf Winter-Ebmer for their useful comments on a previous version of this paper and stimulating discussion. Financial support for this research was generously provided by the CLE. Andrea Weber acknowledges financial support form the Austrian Science Foundation, Project Nr J2365-G05. All errors and opinions are the authors' sole responsibility.

†University of Oxford and UC Berkeley, e-mail: emilia.delbono@economics.oxford.ac.uk; corresponding address: 549 Evans Hall #3880, Berkeley, CA 94720-3880, U.S.A.

‡Institute for Advanced Studies Vienna and UC Berkeley, e-mail: andrea.weber@ihs.ac.at

1 Introduction

Seasonal employment fluctuations can result from seasonal variations in demand over the calender year as a consequence of climatic or geographical conditions. They are often observed mainly within certain industries like tourism and construction and are particularly pronounced in Canada and the Scandinavian countries. Among middle European countries Austria is a notable exception, as it is characterized by a very high share of seasonal employment with respect to its neighbors (Fischer and Pichelmann, 1991).

The phenomenon of seasonal employment is often discussed in connection with the unemployment insurance system and, where they apply, experience rating provisions. This is because in order to reduce the extent to which firms (as well as workers) use unemployment insurance to face anticipated rather than unanticipated periods of unemployment, many countries require employers to pay extra contributions per worker in proportion to their turnover.

In this paper we propose to investigate wage differentials across seasonal and non seasonal jobs. In a world without unemployment insurance and low mobility costs, seasonal firms would have to pay wages that are high enough to compensate their workers for the fact that they work only part of the year. In the presence of unemployment insurance, seasonal workers receive compensation when not working thereby reducing the extent to which seasonal employers have to pay a wage premium in order to attract them. With no experience rating, employers affected by seasonal demand fluctuations do not have to pay extra (or not as much). Following this idea, we focus here on an explanation of the compensating wage differential in terms of working time restrictions and higher risk of unemployment in seasonal jobs.

The topic relates to an ongoing discussion in the labor supply literature, which seeks to determine whether all information is incorporated in the equilibrium price (i.e. the competitive wage), or whether demand-side elements can directly influence individual's labor supply decisions (Card, 1984; Ham, 1986). In the context of seasonal employment, working time restrictions caused by largely predictable changes in labor demand conditions could be seen as having a direct effect on wage compensation. This leads us to refer to the model developed by Abowd and Ashenfelter (1981) in which the compensating wage differential between constrained and unconstrained jobs is seen as proportional to the square of the anticipated variation in individual unemployment and its variance. Using standard labor demand and risk theory and taking into account the role of the unemployment insurance system, the model suggests that the factors of proportionality can be given an interpretation in terms of the compensated labor supply elasticity and the coefficient of relative risk aversion.

Despite the intuitive appeal of the theoretical framework it has so far proved difficult to find clear empirical evidence for the existence of a compensating wage differential. The main problem is to distinguish between those workers affected by demand-side restrictions and those who are not. Very often this distinction can only be established by crude proxies, such as industry affiliation or self-reported definitions (Moretti, 2000; Murphy and Topel, 1987). Moreover, these measures are often only available on a cross sectional level and there is no way to control for unobserved industry or person specific elements, like the taste for more leisure.

We are going to approach this problem by investigating seasonal employment variations in the Austrian economy. The institutional framework in Austria, characterized by centralized wage bargaining and a universal unemployment system without experience rating, seems to promote high employment turnover and seasonal employment. The high share of seasonal employment in this economy, however, provides the ideal setting in which to empirically test the model. We make use of the rich longitudinal, individual level information contained in the Austrian social security records. Here we exploit the pattern of employment and unemployment spells observed for the same individual and derive a flexible definition of seasonal employment by considering patterns which show a yearly regularity.

Using this definition of seasonal employment we able to observe changes in wage rates across seasonal and long term employment periods for the same individual. We relate those changes to variations in his working time restrictions, captured by days of unemployment. In order to resolve the potential endogeneity of unemployment with respect to wages we use the yearly variation in the starting month of seasonal jobs as an instrument. The idea is that starting the job later in the season implies higher working time restrictions and the employer rewards workers waiting until the season peaks with higher wages.

We are able to show that while a significant and positive amount of the differential is paid by the employer, a large part of the compensation is covered by the unemployment insurance system. This results in an average negative wage differential for seasonal jobs and suggest that there is scope for the introduction of a system of experience rating in Austria.

The paper is organized as follows. Section 2 presents some descriptive evidence on the seasonal variation in employment in Austria and a brief overview of the relevant institutional factors which explain it. Section 3 and 4 introduce the theoretical model and its empirical implementation. Section 5 describes our data and our definition of seasonality. The results are presented in section 6, while the last section concludes.

2 Seasonal employment in Austria

Seasonal fluctuations in employment in Austria have historically been of considerable magnitude. As we can see in figure 1, the variation in the percentage of workers employed over the active population is characterized by a pattern which repeats itself regularly during the various phases of the business cycle.

Both men and women are affected by this phenomenon, although there are important differences. Apart from the period between the early-70s and the early-80s, the magnitude of the variation in the employment/active ratio for men was higher than what observed for women, at least 5 percentage points greater. Moreover, while male employment peaks in the summer and presents a trough in the winter, a second smaller peak appears during the winter from the early 80s onwards in women's employment.

This phenomenon is very atypical for a continental European country. In this respect Austria is much more similar to Canada than Germany, for example (de Raaf et al., 2000).[1] To give some idea of the relative magnitude of the seasonal cycle in Austria, figures 2 and 3 plot monthly seasonal employment and its average deviation from a country-specific trend for Austria, Germany, the USA and Canada between 2001 to 2004. The first graph shows the existence of a regular yearly pattern for all countries. The second graph shows that the average amplitude of the seasonal variation experienced in Austria is very similar to that observed in Canada, i.e. about 5 percentage points from peak to trough. The USA and Germany experience much smaller variations, of about 2 percentage points on average, and in Germany the pattern is clearly different from what we can see elsewhere.

The industries most exposed to seasonal demand variations are construction and tourism and this is accentuated in Austria due to the climatic and geographical conditions. Due to its bad weather, almost all activity in construction is shut down during the winter months - roughly between December and February. Outside the bigger cities, tourism is concentrated in the western, alpine regions of Austria where it is characterized by two yearly seasons. The main season is the skiing season, which occurs during winter and lasts from December to April, the second - shorter season - occurs during the summer. Given that

[1] Only Northern European countries such as Sweden and Norway experience similar seasonal upswings, but that is easily explained by their much rougher climate.

construction and tourism are relatively important industries in the Austrian economy, one can expect that their pronounced seasonal fluctuations also affect other industries.[2] Indeed, if we look at employment by industry in figure 4 we find seasonal patterns throughout the economy.

The high incidence of seasonal employment in Austria cannot be entirely explained by geographic and climatic circumstances, however. Economic policy and labor market institutions are thought play an important role. Figure 1 shows that when the reconstruction period which followed the second world war came to an end in the early 1970s seasonal fluctuations in (particularly male) employment started to fade out. Roughly at the same time the social democrats came into power, maintaining a strong influence in Parliament until the end of the century. The successive socialist governments subsidized huge construction projects as a means to generate jobs and promoted tourism as one of the main stabilizing factors in regional and trade imbalances. These policies led to a renewed impulse in seasonal cycles.

In Austria wages are set by collective agreements stipulated between employer, employee representatives, unions and government officials. It is often argued that this centralized wage bargaining process increases real wage flexibility at the macro level but at the same time decreases the single firm's ability to react to idiosyncratic shocks. The consequence are quantity adjustments in the form of relatively high job turnover rates.[3] Collective agreements fix minimum wages at the industry level, but employers are of course free to negotiate higher wages with individual workers, which results in the wage variation we will explore. Among the other institutional features in Austria, which promote seasonal em-

[2]According to the Labour Force Survey, in 2001 the share of employment in the construction sector was 8.8 in Austria and 7.9 per cent in the EU-15 as a whole, the corresponding shares in those sectors were 5.4 and 4.0.

[3]Stiglbauer et al. (2003) find that yearly job creation and destruction rates in Austria are comparable to the US. Fischer and Pichelmann (1991) show that in Austria about one-third of all unemployment spells per year and almost one-fourth of total unemployment can be ascribed to seasonal fluctuations, similarly to the USA or Canada. Hofer et al. (2001) show results that point toward rigid relative wage structures and high job turnover at the same time.

ployment fluctuations, we note the role of the unemployment insurance system which does not have an element of experience rating, and the relatively mild and industry-specific regulations on hiring and firing for blue collar workers.

The system of unemployment insurance in Austria is almost universal, that is to say compulsory for all except the self-employed. It is articulated in the administration of unemployment benefits (Arbeitslosengeld) and, after these expire, unemployment assistance (Notstandshilfe). In order to qualify for unemployment benefits a worker must have been employed for at least 52 weeks in the past two years.[4] The duration of the period of unemployment benefits can be up to 30 weeks, depending on the duration of the employment period preceding the spell of unemployment. The replacement ratio is about 45 per cent of gross income, which is low by European standards, but it becomes potentially higher once family allowances and other benefits are taken into account. After unemployment benefits are exhausted, the worker can apply to receive unemployment assistance, which is means tested. The duration of this programme is potentially indefinite and under this scheme the worker receives up to 92 per cent of the amount of the previous unemployment benefits.

While the OECD draws a picture of Austria as a typical continental European country with a highly regulated labor market, the real picture is much more diverse (OECD, 2003). We find that no regulations apply to layoffs in jobs with a duration less than 6 months. For longer jobs a period of advanced notice is required during which the employee gets time off to look for a new job. The period of notice for blue collar workers is regulated separately by industry in collective bargained contracts and typically is no more than 2 weeks. Severance payment rules apply only for job durations above 3 years.

The combination of these elements and the complete absence of any form of experience rating result in an implicit subsidy to industries which experience

[4] This requirement is lowered to only 26 weeks within the past year for young people below 25 and for those repeatedly unemployed.

periodic and predictable seasonal fluctuations in demand.[5] Despite repeated attempts to reform the tax and social security system, the basic structure of Austrian social policy - as it has been outlined above - has remained unaltered throughout many decades. Moreover, since our main period of investigation covers the years 1989 to 2001 and only smaller and narrowly targeted interventions took place during these years, we will not address here any issue related to these reforms.

3 A theoretical model of compensating wage differentials

The importance of the construction and tourism sectors in Austria and the magnitude and regularity of the seasonal cycles clearly suggest that the institutional setting allows some employers to react flexibly to demand conditions. It is therefore possible to think of the Austrian labor market as being characterized by two types of implicit contractual agreements. In the first scenario a worker is employed throughout the entire year, while in the second case the worker is offered a seasonal job and is temporarily laid off during the off-season to be rehired at a later point in time.

A simple framework to understand a worker's decision to work either in a permanent or a seasonal job is that proposed by Abowd and Ashenfelter (1981). Their model shows that the determination of wage rates is linked to anticipated working time constraints through the compensated labor supply elasticity and the coefficient of relative risk aversion. The model is developed in the context of conventional labor supply and risk theory and the existence of unemployment insurance can be easily taken into account.

[5]The phenomenon is large and difficult to quantify, but it was estimated that in 1993 the direct costs (unemployment insurance and unemployment benefits) amounted to about 250m Euros, while taking into account also social security contributions and payroll taxes not paid brings the total to 290m Euros, almost 0.2 percent of GDP (Brandel et al., 1994).

Consider an economy characterized by two types of contracts: one without constraints on working time and the other with some constraints. Under the unconstrained contract the worker can choose the optimal amount of working time h^0 to supply at a fixed wage rate w. Under the constrained contract the worker accepts a contract which sets the working time at $\bar{h} < h^0$ and the wage at w^*. The model is static, there is no substitution over time. If workers are identical in all respects and there are no costs to moving between different types of jobs, the worker's utility must be the same in these two scenarios. This equilibrium condition implies that under the contract with working time restrictions a compensating wage differential must be paid to the worker in order to give him the same utility level he would achieve under the other type of contract.

The equilibrium condition formalizes the relationship between the compensating wage differential and the working hours restrictions imposed by the employer under the constrained contract. In particular, it can be shown that in the presence of working hours constraints the competitive wage incorporates a compensating differential which is proportional to the squared unemployment rate, where the coefficient of proportionality is given by half the inverse of the compensated labor supply elasticity. That is:

$$\frac{w^* - w}{w} \sim \frac{1}{2e} \frac{(h^0 - \bar{h})^2}{\bar{h} h^0}, \tag{1}$$

where e is the compensated labor supply elasticity.[6]

Now assume that the working time restriction is not a priori fixed, but there is some uncertainty attached to it. In this case, a risk averse employee asks for an extra compensation for the risk and gets a wage w^{**}. The actual time worked can be modelled as a random variable $\tilde{h}$ with $E(\tilde{h}) = \bar{h}$ and $V(\tilde{h}) = \sigma^2$. The additional element contributing to the compensating wage differential can be

[6]For the exact derivations see Abowd and Ashenfelter (1981).

shown to be proportional to the variance of expected unemployment. Formally, we can write:

$$\frac{w^{**} - w^{*}}{w^{*}} \sim \frac{1}{2} r \frac{\sigma^2}{\bar{h}^2}, \tag{2}$$

where the factor of proportionality is half the coefficient of relative risk aversion r.

Next, we can consider the effect of unemployment insurance on the wage differential. Suppose that under the unemployment insurance scheme benefits cover the wage for a fraction γ of the lost working time $h^0 - \bar{h}$ and total labor income amounts to $w^{**}[\bar{h} + \gamma(h^0 - \bar{h})]$. Ignoring uncertainty, the wage differential can be expressed as:

$$\frac{w^{*} - w}{w} \sim -\frac{\gamma(h^0 - \bar{h})}{\bar{h} + \gamma(h^0 - \bar{h})} + \frac{1}{2e} \frac{(h^0 - \bar{h})^2}{h^0[\bar{h} + \gamma(h^0 - \bar{h})]}. \tag{3}$$

As we can see, the existence of an unemployment insurance system implies that the compensating differential falls in proportion to anticipated unemployment, with the factor of proportionality being represented by the unemployment benefit replacement rate. This means that in the presence of unemployment insurance the wage differential could be negative even when employers offer a positive amount to compensate workers for restrictions on their working time.

In the case with uncertainty the additional part of the differential is given by:

$$\frac{w^{**} - w^{*}}{w^{*}} \sim \frac{1}{2} r \frac{\sigma^2}{\bar{h}[\bar{h} + \gamma(h^0 - \bar{h})]}. \tag{4}$$

If we combine equations (4) and (3), the total compensating wage differential amounts to:

$$\begin{aligned} \frac{w^{**} - w}{w} \sim & -\frac{\gamma(h^0 - \bar{h})}{\bar{h} + \gamma(h^0 - \bar{h})} + \frac{1}{2e} \frac{(h^0 - \bar{h})^2}{h^0[\bar{h} + \gamma(h^0 - \bar{h})]} \\ & + \frac{w^{*}}{w} \frac{1}{2} r \frac{\sigma^2}{\bar{h}[\bar{h} + \gamma(h^0 - \bar{h})]}. \end{aligned} \tag{5}$$

Expressed otherwise, and omitting cross product terms (or approximating $\frac{w^*}{w} \sim 1$) we get the equation estimated by Abowd and Ashenfelter (1981):

$$\frac{w^{**}-w}{w} \sim -\frac{\gamma(h^0-\bar{h})}{h^0+(\gamma-1)(h^0-\bar{h})}+\frac{1}{2}\frac{1}{e}\frac{(h^0-\bar{h})^2}{h^0[h^0+(\gamma-1)(h^0-\bar{h})]} + \frac{1}{2}r\frac{\sigma^2}{\bar{h}[h^0+(\gamma-1)(h^0-\bar{h})]}. \quad (6)$$

We apply this model with a slight simplification in order to avoid the nonlinearity in the parameter γ. Specifically, we assume $h^0 + (\gamma - 1)(h^0 - \bar{h}) = h^0$.[7] This allows us to express the compensated wage differential as:

$$\frac{w^{**}-w}{w} \sim -\gamma\left(\frac{h^0-\bar{h}}{h^0}\right)+\frac{1}{2e}\left(\frac{h^0-\bar{h}}{h^0}\right)^2+\frac{1}{2}r\frac{\sigma^2}{\bar{h}h^0}, \quad (7)$$

and proceed with an empirical strategy in order to subject it to adequate testing.

4 Model application and estimation

We apply the model of working time restriction and compensated wage differentials to a labor market with permanent jobs and seasonal jobs. Workers in permanent jobs are employed over the entire year whereas workers in seasonal jobs are restricted to work only for part of the year. The measure of working time is the number of days at work during the year. We assume that a worker i in a permanent job works h^0 equal to 365 days a year. The seasonal worker is affected by time restrictions and works a number of days $\bar{h}_{it}$ in year t. The wage variable w_{it} refers to the gross monthly wage.

[7] We know that the net replacement ratio is 0.55 and that the gross replacement ratio is about 0.45, but this figure does not take family allowances into account, so that a value of γ above 0.50 could still be reasonable. Our data also shows that $(h^0 - \bar{h})/h^0 \sim 0.19$ for seasonal workers. Therefore, our approximation error is likely to be rather small.

Our estimated model is based on the following fixed effects specification:

$$\ln w_{it} = X_{it}\beta - \gamma\left(\frac{h^0 - \bar{h}_{it}}{h^0}\right) + \frac{1}{2e}\left(\frac{h^0 - \bar{h}_{it}}{h^0}\right)^2 + u_i + \epsilon_{it}, \tag{8}$$

where X_{it} is a set of time varying individual characteristics determining the wage and the coefficient vector β measures their influence. The second and third term on the right-hand side are different from zero only for seasonal workers as those in non seasonal jobs anticipate zero unemployment. The estimated parameters are γ, the replacement ratio implied by the unemployment insurance system, and e, the compensated labor supply elasticity. Individual unemployment measured as the percentage of days unemployed during the year is used as a proxy for $\frac{h^0 - \bar{h}_{it}}{h^0}$. The error term consists of an individual specific component u_i reflecting time invariant differences in taste for consumption and leisure and a time varying component ϵ_{it}.

Because what matters according to the theory is *anticipated* and not *actual* unemployment, and because of the potential endogeneity of individual unemployment with respect to wage rates, we use an instrumental variable strategy to predict unemployment durations over the year. Our proposed instrument is the starting month of employment spells. This is because the existence of regular seasonal cycles makes the amount of time employed highly predictable for seasonal workers. So that, if someone starts a job early in the season he can expect a longer employment duration than someone starting later on, simply because of the fixed duration of the seasonal cycle. The maintained basic assumption underlying this strategy is that individual-level variation in the starting month of the employment spell is exogenous with respect to wage rates once we control for its effect on unemployment duration.

We estimate the above model in two stages. In the first stage regression we model the actual percentage of time unemployed experienced by the individual in terms of all the observable characteristics of the worker as well as variation in the starting month of the spell. In the second stage equation we use the predicted values of individual unemployment as a proxy for $\frac{h^0-\bar{h}_{it}}{h^0}$ and estimate the parameters γ and e according to equation (8).

In order to account for the presence of uncertainty, we estimate a second version of the second stage equation:

$$\ln w_{it} = X_{it}\beta - \gamma\left(\frac{h^0-\bar{h}_{it}}{h^0}\right) + \frac{1}{2e}\left(\frac{h^0-\bar{h}_{it}}{h^0}\right)^2 + \frac{1}{2}r\frac{\sigma_{it}^2}{(h^0)^2} + u_i + \epsilon_{it}, \quad (9)$$

where we incorporate the effect of uncertainty by using the standard deviation of the predicted unemployment durations as a proxy for $\frac{\sigma_{it}^2}{(h^0)^2}$ and derive an estimate of the coefficient of relative risk aversion r.

5 Data

We use longitudinal information on a random sample of male workers drawn from the Austrian social security records during the years 1984-2001. The social security authority collects detailed information on all workers in Austria, with the exception of self-employed, civil servants and marginal workers. The sample we use for our analysis consists of new entrants into the labor market. An individual is defined as an entrant if he was not observed in employment, unemployment, or apprenticeship during the first two years 1984-1985. Thereafter we follow his employment career up to the year 2001. The data contains information on the individual's labor market status in employment, unemployment and various other qualifications on a daily basis. For individuals in employment we can track the employer by an employer identifier. We define a job as an uninterrupted employment spell with the same employer.

The full line in figure 5 plots weekly employment over active population for the sample of males. We find the same regular pattern as in the aggregate figure 1. Since we have a sample with relatively young workers, in our data the seasonal pattern is even more pronounced with an average variation in employment of about 10 percentage points over the year. Figure 9 presents employment by worker type. The graph makes it clear that seasonality affects employment of blue collar workers most. Similarly to figure 4, we find seasonal employment fluctuations in all industries in the sample. Therefore, our analysis will not be restricted to a specific group of industries.

5.1 Definition of seasonality from spell data

The precise timing information and the longitudinal nature of the data allow us to identify patterns of seasonal employment from the spell data and to distinguish them from spells with permanent employment. The idea is to split an individual's employment career into periods of permanent employment with long term jobs, seasonal employment with regular changes between employment and non-employment, and periods without any kind of pattern, which we call periods of frequent changes. The approach we use to define seasonality depends only on the pattern of employment and non-employment during the calender year. In this way our definition of seasonality is similar to de Raaf et al. (2003).

To be specific, we first define a job with a minimum duration of 10 months as *permanent employment*. Sequences of permanent jobs separated by very short interruptions define a *permanent employment period*. Then we define a worker in *seasonal employment* if he ends a job (with a duration of at least 2 months) within the same three-month window in two consecutive years. This definition also allows other jobs to lie in between the two jobs which define the seasonality pattern. We call time stretches with a seasonal employment pattern a *period of seasonal employment*. The residual group of jobs, which do not qualify as either permanent employment or seasonal employment are classified as *frequent change* jobs. Taken together, all these jobs define *periods of frequent employment change*. Each period can consist of a series of spells in employment, unemployment or economic inactivity. In this way we avoid restricting the definition of seasonal employment to specific industries, times of the year, or employer recalls.

Figure 10 illustrates the definitions by way of example: the first employment spell, signified by the grey bar, in years 1 and 2 is classified as a long term job and defines a permanent employment period. The next two employment spells (striped bars) end in the same month in years 3 and 4, consequently they define a seasonal employment period. The last two short spells (white bars) in years 4 and 5 show no such regularity in their ending month. Hence they are ascribed to a period of frequent changes.

To see what the effect of this definition is in practice, we plot the ratio of employed over active population for all but the seasonal workers, as a dashed line in figure 5. Excluding seasonality according to our definition reduces the yearly employment variation by half. This means that our definition takes a conservative point of view but it clearly captures the phenomenon. Some of the seasonal demand variation is still reflected in the periods with frequent changes. This is even more convincingly shown in figure 6, which gives the share of employed over active population in the three employment categories by week of the year. The variation over the year is largest in seasonal employment, where employment peaks during the summer months and is lowest in February. We see, however, lower employment ratios during the winter also in the frequent change group and even a small dip in employment at the beginning of the year for permanent workers.

Another way of looking at differences among employment periods is to investigate the variation of starting and ending months of single job spells. We do this by calculating the standard deviation over all starting months (ending months) of the jobs held by a worker during a period of employment.[8] Table 1 shows the variation in starting and ending months, or average standard deviations, in the sample of male, Austrian, blue collar workers, aged between 15 and 50,

[8]We calculate the standard deviations taking account of the cyclical nature of the calender months.

which will be the reference sample in our estimations.[9]

The top panel of table 1 shows monthly variations for different types of employment periods. In the definition of seasonal jobs we restrict the variation in the ending month. Consequently seasonal periods show least variation in ending months. For the starting month of the employment spell, however, there is a high variation among seasonal periods. The average standard deviation is 1.7 months. This is even slightly higher than for frequent change periods, and much higher than for permanent employment periods.

Concentrating our attention on seasonal periods only, we can see in the bottom part of table 1 that there is variation in starting month for all industries. The highest variation we find is in tourism, probably because there are two seasons during the year. As another check, we divide periods according to whether the individual is recalled to the same employer or not. The former show a somewhat lower variation (1.6 months) in starting months than periods in which no recall occurs (1.9 months). This is not surprising, as individuals on recall may face more regular working patterns. What our table shows, however, is that even during periods in which recalls occur there is quite a lot of variation in the starting months of the employment spells.

We also introduce a second definition of seasonality for sensitivity checks. Under this definition we restrict seasonal jobs not only to end in the same three months window, but also to have the same duration (plus, minus 30 days). This *restricted definition* of seasonality considerably reduces the number of periods identified as seasonal compared to the *wider definition* given above. Figure 7 shows that under the restricted definition omitting seasonal workers hardly reduces the seasonal variation in male employment, whereas it had been almost halved under the wider definition in figure 5. Figure 8 repeats figure 6 for the restricted definition. The difference in definitions affects the classification into

[9]Notice that standard deviations can only be calculated for periods with two or more employment spells.

seasonal or frequent change periods. We now find higher variation in employment for frequent change periods over the weeks of the year and a stronger curvature of seasonal employment in summer. Having made these observations we argue that the wider definition gives a more plausible description of the seasonality phenomenon. In what follows we will refer to it as our preferred definition of seasonality.

5.2 Employment and wage panel

In our analysis of wage differentials we focus on male workers who are either in seasonal or in permanent employment. We restrict the sample to Austrian, blue collar workers, aged between 15 and 50. We select this group of workers, because Austrian workers are better covered by the unemployment insurance system. Seasonal firms often hire foreign workers with temporary working permits, e.g. in agriculture and tourism. These workers are not comparable to workers living in Austria throughout the year. Also, among young male blue collar workers the share of seasonal employment is especially high. In addition, they are not affected by two problems which typically complicate studies based on administrative data: the share of part time work in this group is thought to be very low, and almost all wages are below the top coding threshold.[10] We restrict the time horizon of the panel to the years 1989-2001, because there are few observations in the first years.

From the spell data with seasonal and permanent employment periods we generate a panel with yearly frequency. This panel will be the basis for the estimations. We do this the following way. First, we define the yearly employment as seasonal or permanent on the basis of the period which occupied the larger

[10] In our sample we observe a share of 0.05% top-censored wages. Moreover, since the upper ceiling for unemployment benefits depends on the upper earnings limit for social security contributions, we can ignore both these problems. As for workers who earn below the minimum level of contribution, i.e. the so-called marginal workers, we only know that a very large group of them (about 72 percent) are women and therefore we do not think this will affect our results.

part of the year. Next, we select a representative employment spell from which we get information about wage, industry, and other characteristics.

For permanent employment we select the spell with the longest duration during the current year. For seasonal employment we select the spell with the longest employer tenure. We restrict ourselves to years in which the individual worked for more than 90 days, and in which the individual was either in seasonal or permanent employment. From the resulting sample we use only continuous sequences of yearly observations. If there is more than one sequence per individual we select the longest one.

Working time restrictions for seasonal workers are defined by the percentage of days unemployed during the calender year. This definition may be a bit problematic in years when an individual changes between employment periods. Since observations on these switches identify the key parameters in the fixed effects model, we also experiment with an alternative definition. We calculate working time restrictions as the percentage of days unemployed during the current period in each calender year, taking into account that the period may only cover part of the calender year.[11,12]

Using these rules, we get an unbalanced panel of 1,777 workers for whom we have a total of 13,507 yearly observations. According to table 2, which reports summary statistics at the individual level, 27.6% of the workers are observed in seasonal employment at least once (11.3% under the restricted definition). We also observe a high number of transitions between seasonal and permanent employment. This share of about 22% of workers is important for the identification of wage differences between seasonal and permanent jobs.

[11]The definition of employment periods by job spells is inconclusive on the exact starting end ending date of the period. Hence we define them by the first and last days in employment and allow for gaps between the periods.

[12]We also experimented with the percentage of days spent in non-employment (unemployment or economic inactivity). We dismissed the results as implausible, however, as Austrian, prime age, male workers are usually fully covered by the insurance system. Times of economic inactivity for them are probably the result of illness or working abroad.

Transitions occur in both directions, from seasonal to permanent jobs and the other way round, with about the same frequency. This can be seen at the individual level according to the type of the first transition in a subject's career in table 2 and also in in figure 11, were we present the distribution of transitions by type and age for all person-year observations in our sample. It appears that there is no clear sign of career advancement form seasonal to permanent jobs. This is perhaps not too surprising given that our sample consists mainly of very young workers (see figure 12).

Table 3 reports summary statistics on all person-year observations. These include 1,631 (12%) occurrences of seasonal jobs. The table is divided in three sub-panels reporting observations by industry, region and starting month of the spell. The industries with the highest number of person-year observations are manufacturing and construction. It is obvious that most of the seasonal jobs are concentrated in construction and tourism, which together account for about half of the seasonal observations. But we find seasonality in every industry.

Seasonality also varies with the region. Especially in the Alpine parts (Salzburg, Tirol, Carinthia) of the country, which rely heavily on the tourism industry, we observe a high share of seasonal employment. The two different seasonal cycles are clearly marked by the starting month of job spells. Seasonal jobs typically start in the spring (March - May) or in December when the winter season takes off. For permanent jobs, on the other hand, the distribution of the starting month of the spell is fairly even throughout the year, with peaks occurring only in January, March, and September (corresponding statistics for the restricted definition are given in table 4).

Descriptive statistics on log monthly wages and explanatory variables included in the regressions are found in table 5. In our sample permanent jobs pay on average more than seasonal jobs, with an average raw differential of about 11 percentage points. Figure 13 plots the mean wage differentials over time for the different industries. We find the largest negative differentials in agriculture and manufacturing, followed by services and transport (car sales, wholesales and retail are numerically much less important in our data). Interestingly, the differential is almost zero in the construction and hotel industry, which is where the largest fraction of seasonal employment is concentrated.

6 Empirical results

In the following discussion we present all the results using the two alternative definitions of seasonal employment. We will comment mainly the tables which refer to the wider definition of seasonality and point out only major differences where they arise. All our analysis is conducted using a fixed-effect estimator controlling for unobservable individual-specific heterogeneity. We start with the estimation of a baseline wage equation in order to analyze the pure effect of being in a seasonal job. Then we explore the variation in unemployment using both the percentage of days unemployed during the year and the percentage of days unemployed during the current period in each calender year as the dependent variable. Finally, we present the results of our model, again contrasting different definitions of seasonality and working time restrictions.

The baseline wage equation according to the wider definition of seasonality is presented in table 6. We can see that the overall effect of being in a seasonal job is to reduce the wage by about 8%. Controlling for experience and tenure reduces this gap to about 5% points, whether or not we take into account year, region and industry effects. In the last column we investigate how the wage differential varies according to industries. Here we see that the differential becomes almost zero in the hotel, agriculture and construction as opposed to manufacturing and services sectors, where it is negative.

Apart from taking into account the effect of seasonality, the model is based on a rather conventional specification and therefore all the other parameter estimates are in line with our expectations. For example, we find a concave-shaped relationship in experience and tenure. In particular, we see that the effect of tenure is rather small and this is consistent with the fact that we have a rather young sample of workers.

In order to take into account only changes in anticipated unemployment over time and to address the potential endogeneity of unemployment duration in the analysis of wage differentials, we analyze the determinants of unemployment experience in Table 8. The main source of exogenous variation in unemployment duration is given by the starting month of the spell. As we discussed above, this is motivated by the effect of this variable onto the duration of the employment spell during seasonal periods, since the duration of the season is usually fixed. A further motivation comes from the fact that, as we saw in table 1, workers in seasonal jobs experience a relatively high variation in the starting month of different jobs even during the same employment period.

As we can see in the table, workers in seasonal jobs (in the service sector) experience higher unemployment duration over the year with respect to workers in permanent jobs. In the first column we see that this difference is about 10 percentage points after controlling for individual characteristics and region, time and industry effects. Although we see some variation in unemployment duration by starting month of the spell for workers in permanent jobs, the main effect of the instrument is on workers in seasonal employment.

The magnitude of the coefficients on the starting month dummies for seasonal jobs are usually at least 4 times higher than those for permanent jobs and are much more precisely estimated. It is also clear that there is significant variation in the single coefficients of the starting month dummies in the case of seasonal jobs. The value of the F-statistic on the joint significance of the month dummies is 8.61 for the seasonal jobs and it increases slightly to 10.12 when considering the total effect of starting month dummies.

Looking instead at column three, which uses a definition of unemployment measured with respect to the period, we see that the starting month dummies for permanent spells become much smaller and almost completely insignificant. This is because there is now much less variation in unemployment for permanent spells. Here most of the exogenous variation in unemployment comes from the interactions between the seasonal dummy and the starting month dummies, as shown by the values of the F-tests.

To aid the interpretation of these results, we order the estimated effect of the starting month dummies onto unemployment duration in seasonal years from the lowest (January) to the highest (May) value. We then plot with a solid line the average unemployment duration (during seasonal years) according to this ordering in figure 14. The line shows a clearly positive slope, with average unemployment days increasing from 13% to 25% of the year. We also plot on the same graph the average wage rate during seasonal employment in order to gauge the effect of unemployment on the wage differential before proceeding with the estimation of the model. As we can clearly see from the dashed line, starting months predicting higher unemployment also predict higher seasonal wages.

Our main results are presented in tables 9 and 10. Here we always restrict the effect of unemployment to be zero for permanent jobs. This is consistent with the theoretical model and also with our definition of permanent employment periods, which excludes long unemployment spells. All the tables present different specifications, according to whether unemployment enters the model linearly or in quadratic form. Each specification is first estimated using the actual values of individual unemployment and then compared with an IV estimator, where unemployment is predicted according to the model in table 8. The last column presents the specification corresponding to equation (9), which includes also the standard deviation of the prediction in order to capture unemployment risk.

In the first two columns in Panel A of table 9 unemployment affects the compensating wage differentials linearly. We can see that in the simple fixed-effects model, unemployment is not significant and the entire differential between seasonal and non seasonal jobs is captured by the seasonal job dummy (see also the last column in table 6 for comparison). Moving to the IV estimates, we see that here variation in unemployment becomes the main explanatory variable for the existence of a wage differential. Its effect is now significant and negative, although it is not possible to give this parameter an interpretation in terms of our theoretical model.

In the second part of the table (from column three to five), we address directly the estimation of the compensating wage differential according to the theory. Here we see again that in the simple fixed-effects model the seasonal dummy is the dominant variable, while in the IV estimations the entire effect is captured by the linear and quadratic terms in unemployment. The estimated quadratic function has the expected inverted-u shape. This allows us to decompose the effect of anticipated unemployment into the part due to unemployment insurance and the pure compensating differential arising because of working time restrictions.

On average almost 10% of the loss in earnings due to the seasonal nature of the job is covered by unemployment benefits, while about 6% is paid by the employer. Introducing the standard deviation of the predicted unemployment duration does not result in a significant parameter and the estimated coefficient does not have a meaningful interpretation because the sign is reversed with respect to what the theory predicts. We therefore see that none of the other results changes significantly.

According to these estimates, the implied value of the replacement ratio is between 43 and 49 percentage points, which could be plausible since we know that the gross replacement ratio for unemployment benefits is about 45 percent without accounting for family allowances. The implied value of the compensating labor supply elasticity is between 0.6 and 0.8, which is quite high in comparison to standard estimates of this parameter as reported in the empirical literature on labor supply.

Looking at the effect of unemployment measured over the period in the current year in panel B, we observe very similar findings. In particular, the comparison between the simple fixed-effects model and the IV estimates is very similar to what we saw previously. The implied functional form which links the compensating wage differential to the unemployment duration is identical, although less precisely estimated.

Finally, table 10 shows the estimations based on the restricted definition of seasonal employment. Here the point estimates give a similar picture as the results from the wider definition, but most of the coefficients are insignificant. This is probably a consequence of the weaker source of identification for this model, as the percentage of individuals who change between seasonal and permanent employment over their career is now only 7.6% of the sample.

7 Conclusions

In this paper we bring to the attention an unexplored phenomenon in the Austrian labor market. Unlike similar continental European countries, Austria experiences huge seasonal fluctuations in employment, which make it comparable to Canada. However, whereas in Canada there are few regulations governing employment and firms are taxed in proportion of their turnover, in Austria the institutional setting is less flexible but there is a quite generous unemployment insurance system and no experience rating. This results in potentially large indirect subsidies to industries which operate under seasonal demand fluctuations.

We examine wage differentials between workers in seasonal and non seasonal employment in the context of a theoretical model which relates these differentials to employer-determined working time restrictions. Given that our definition of seasonality is directly derived by observed regular features of employment patterns in the data, we can control for industry and individual specific effects in our estimation procedure. Moreover we can use exogenous variation in the starting month of the employment spell in order to derive a measure of anticipated working time restrictions.

Our results imply that the there is a relationship between the magnitude of the compensating differential and the amount of anticipated unemployment of seasonal workers as predicted by the theory. The implied estimated parameters indicate that a large part of the differential is explained by the unemployment insurance system. This means that employers (and workers) who operate on the basis of seasonal contracts receive an indirect subsidy. A straightforward consequence of this system of incentives appears to be an inefficient allocation of labor.

References

Abowd, J. M., Ashenfelter, O., 1981. Anticipated unemployment, temporary layoffs and compensating wage differntials. In: Rosen, S. (Ed.), Studies in Labor Markets. University of Chicago Press, Chicago, pp. 141–170.

Brandel, F., Hofer, H., Pichelmann, K., 1994. Saisonale Muster von Beschäftigung und Arbeitslosigkeit in Österreich, Materialen zu Wirtschaft und Gesellschaft. Kammer für Arbeiter und Angestellte n. 54.

Card, D., 1984. Supply and demand in the labor market. Working Paper, University of Chicago.

de Raaf, S., Kapsalis, C., Vincent, C., 2003. Seasonal employment and reliance on employment insurance: evidence from the SLID. SDRC Working Paper Series.

de Raaf, S., Motte, A., Vincent, C., 2000. Applied research branch, strategic policy, human resources developent canada. SDRC Working Paper Series.

Fischer, G., Pichelmann, K., 1991. Temporary layoff unemployment in austria: empirical evidence from adiministrative data. Applied Economics 23, 1447–1452.

Ham, J., 1986. Testing whether unemployment represents intertemporal labor supply behavior. Review of Economic Studies 53, 559–578.

Hofer, H., Pichelmann, K., Schuh, A., 2001. Price and quantity adjustments in the Austrian labour market. Applied Economics 33, 581–592.

Moretti, E., 2000. Do wages compensate for risk of unemployment? parametric and semiparametric evidence from seasonal jobs. Journal of Risk and Uncertainty 20, 45–66.

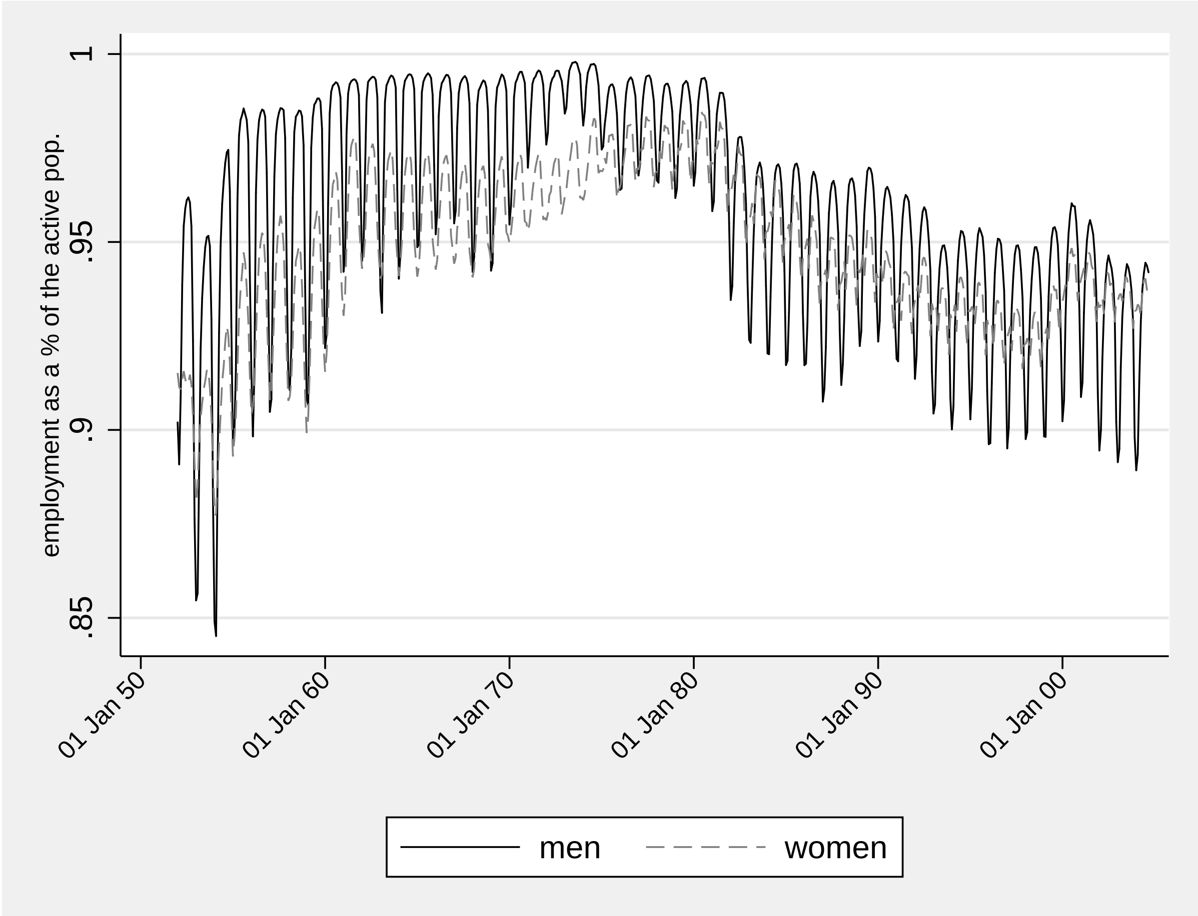
Murphy, K., Topel, R., 1987. Unemployment risk and earnings: testing for equalizing wage differentials in tha labor market. In: Lang, Leonard, J.

(Eds.), Unemployment and the structure of the labor market. Blackwell, New York.

OECD, 2003. OECD Economic Surveys Austria 2003Paris.

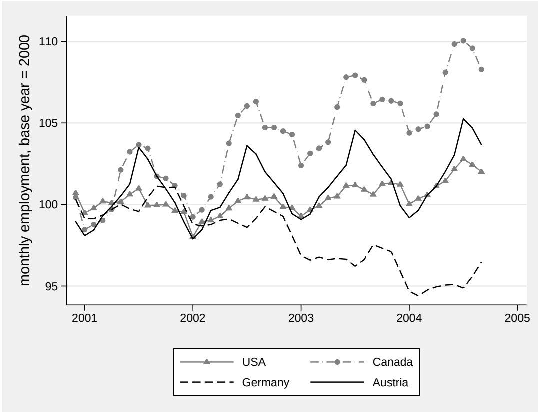
Stiglbauer, A., Stahl, F., Winter-Ebmer, R., Zweimüller, J., 2003. Job creation and job destruction in a regulated labor market: The case of Austria. Empirica 30, 127 – 148.

Figure 1: Total monthly employment over active population in Austria



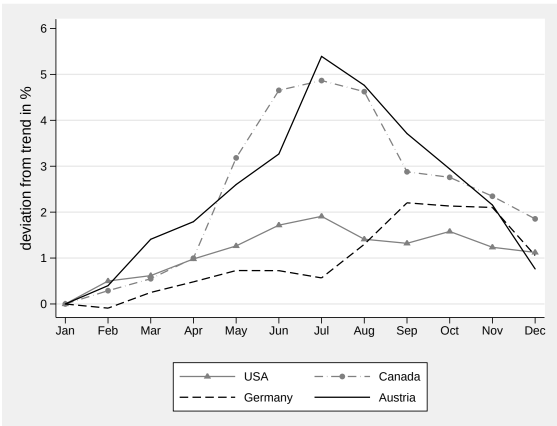
Source: Statistics Austria.

Figure 2: Seasonal variation in total monthly employment by country



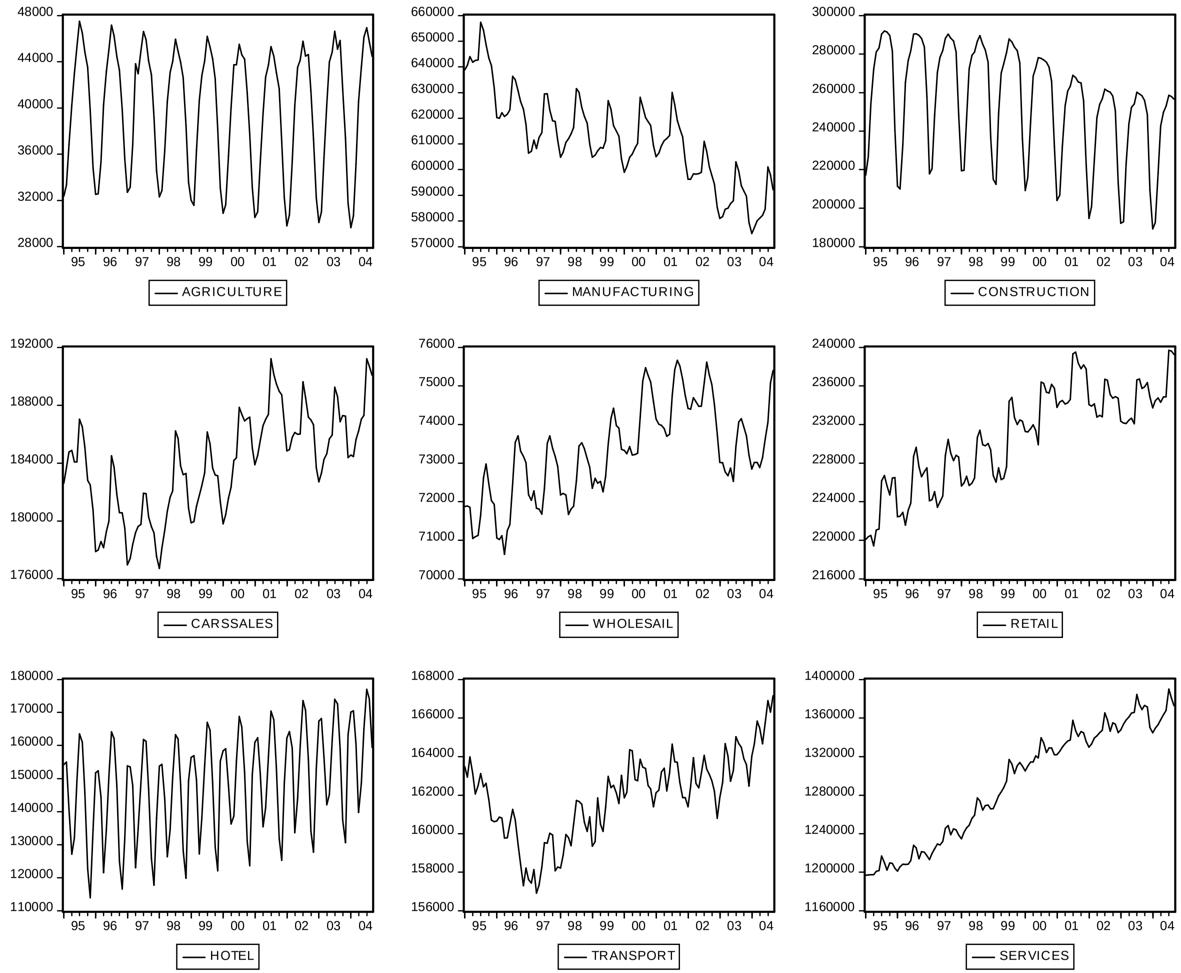
Notes: Total monthly employment normalized at 2000. Series for Austria and Germany exclude self-employed. Source: OECD Main Economic Indicators, Statistics Austria, Statistics Germany.

Figure 3: Amplitude of seasonal variation in total monthly employment by country



Notes: Average deviation of total monthly employment from one-year moving average. Series for Austria and Germany exclude self-employed. Source: OECD Main Economic Indicators, Statistics Austria, Statistics Germany.

Figure 4: Total monthly employment in Austria by industry



Source: Statistics Austria.

Figure 5: Proportion of male employment over active population by week of the year taking into account seasonal employment (wider def.)

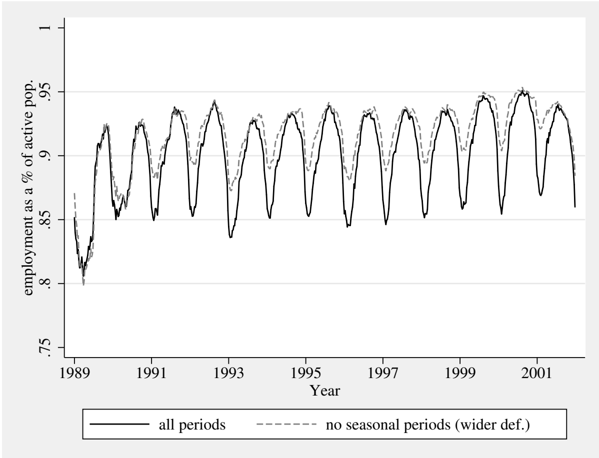


Figure 6: Proportion of male employment over active population by week of the year and by type of employment (wider def.)

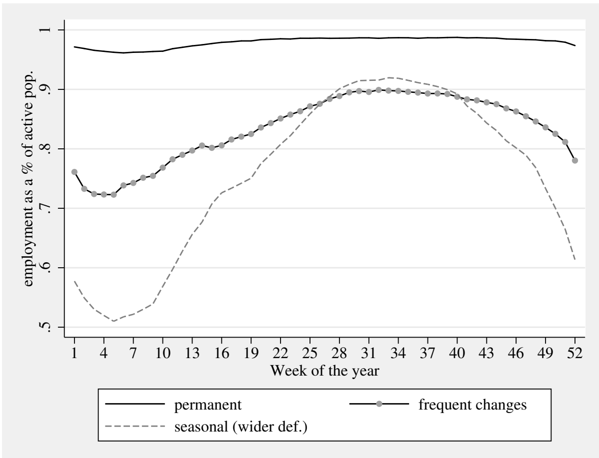


Figure 7: Proportion of male employment over active population by week of the year taking into account seasonal employment (restricted def.)

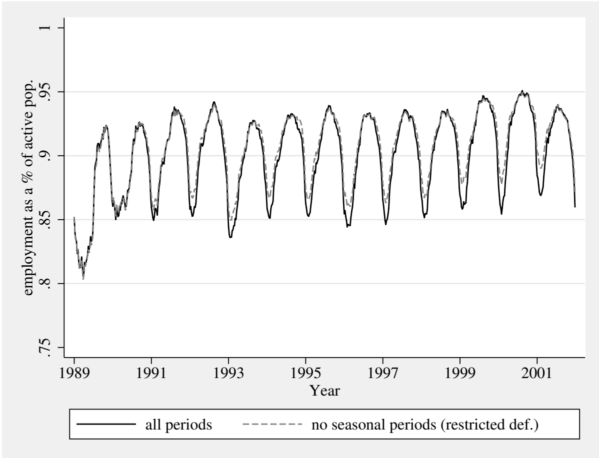


Figure 8: Proportion of male employment over active population by week of the year and by type of employment (restricted def.)

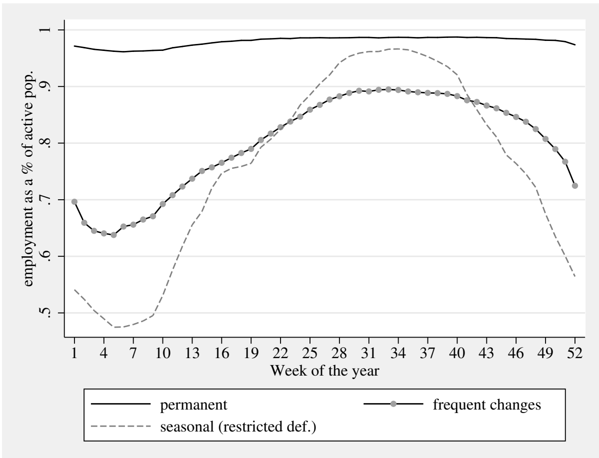


Figure 9: Proportion of male employment over active male population by week of the year and by occupational qualification

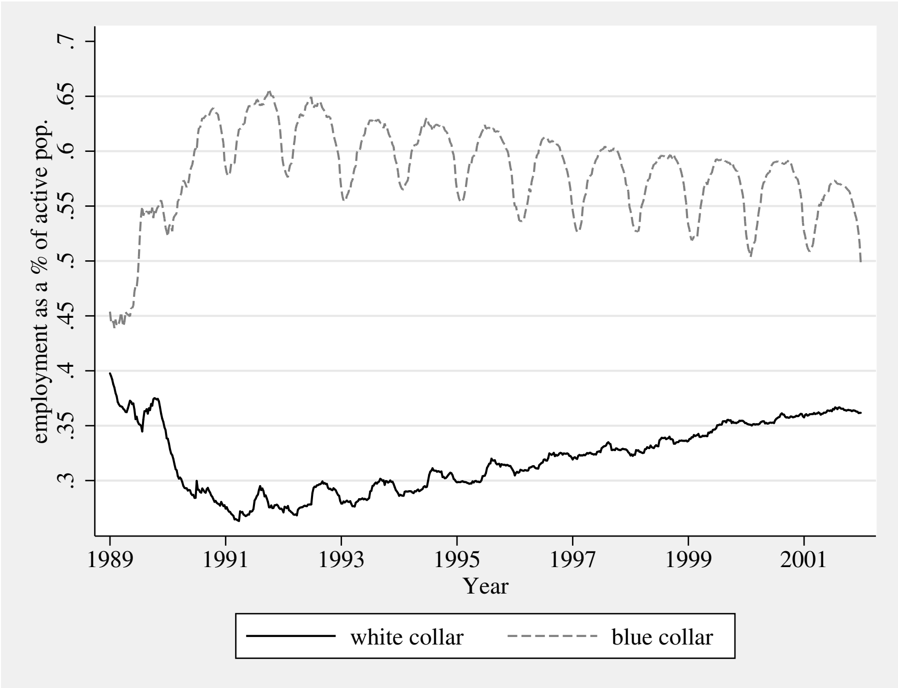


Figure 10: Definition of seasonal and permanent employment periods

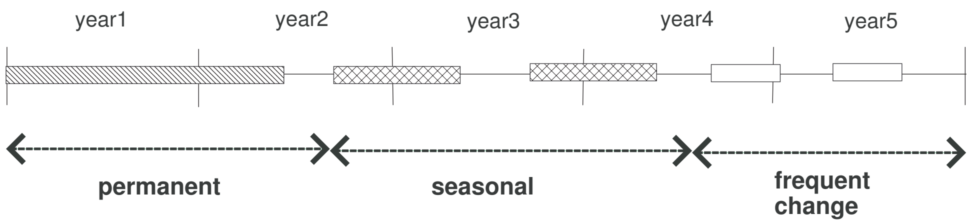


Figure 11: Distribution of transitions between employment states by age

Figure 12: Distribution of age

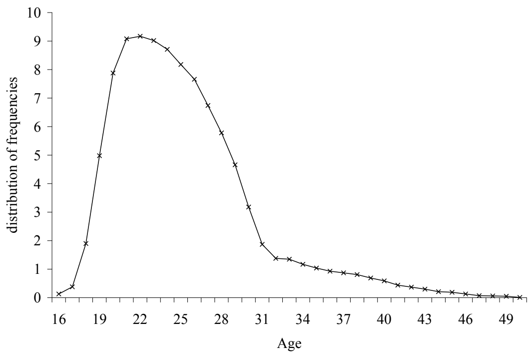


Figure 13: Average wage differentials by industry and year

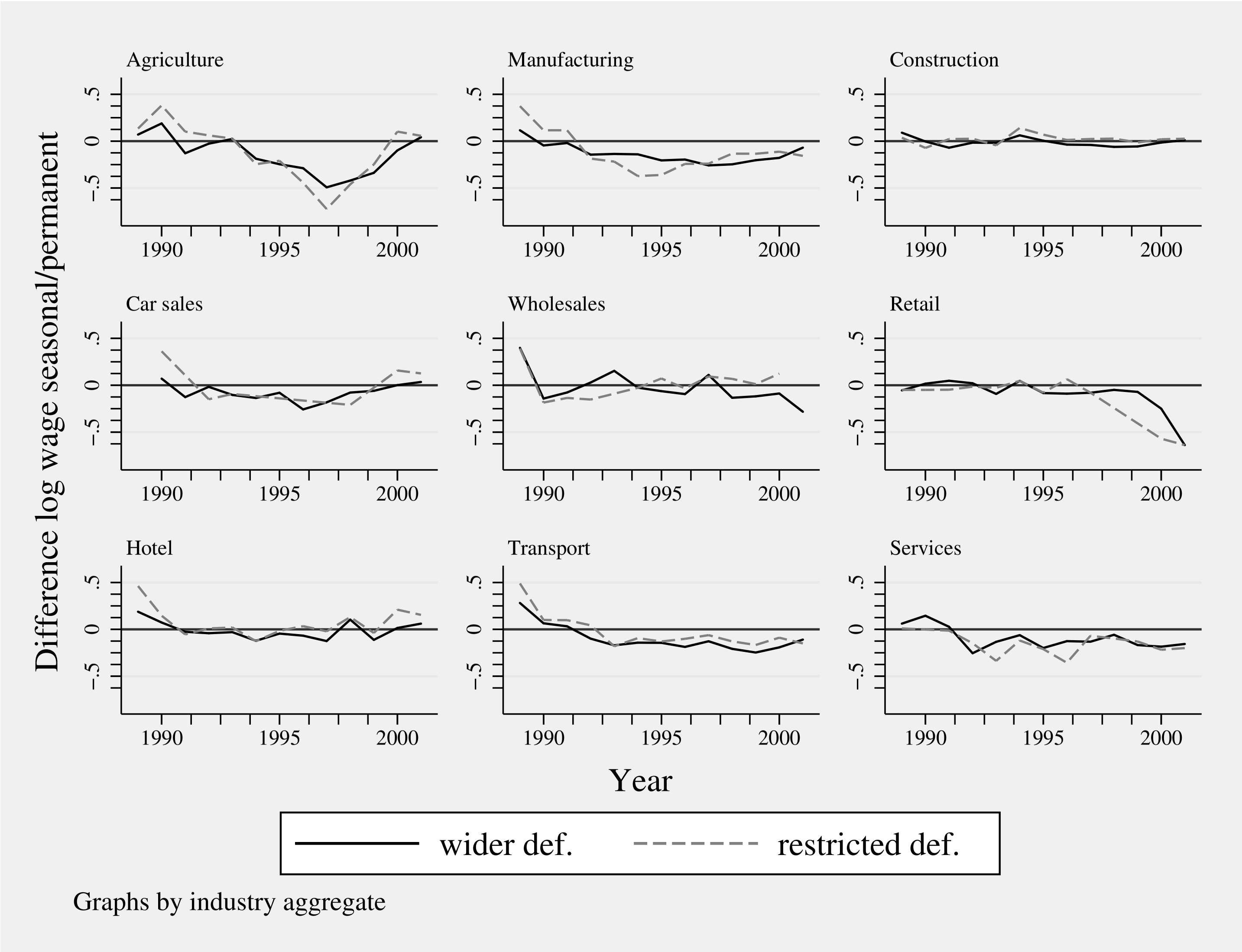
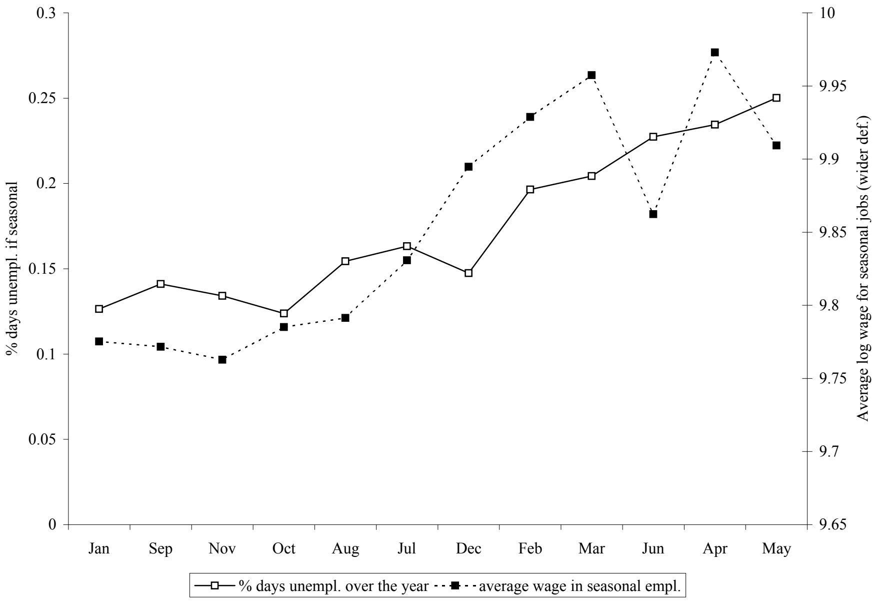


Figure 14: Average % days unemployed over the year and average wage in seasonal employment by starting month of the spell



Notes: Months ordered according to the effect of the starting month dummies on unemployment during seasonal periods as shown in table 8, column 1.

Table 1: Individual variation in job starting end ending months calculated as standard deviations during each employment period

	Standard dev. of starting month	Standard dev. of ending month	Number of periods
All employment periods			
Type of employment period			
Permanent	1.5541	1.4280	836
Seasonal (wider def.)	1.7239	1.3013	804
Frequent changes	1.6924	1.8764	817
Total			2457
Seasonal employment periods			
Industry			
Agriculture	1.6970	1.0886	32
Manufacturing	1.5737	1.1203	148
Constructions	1.7195	1.1548	235
Car sales	1.6519	1.1651	27
Wholesales	1.7043	1.5131	35
Retail	1.2824	0.9291	11
Hotel	1.9827	1.7920	107
Transport	1.6125	1.2513	82
Services	1.8316	1.4611	126
Individual recalled to the same employer			
No recall	1.9052	1.3655	266
Recall	1.6343	1.2696	538
Total			804

Notes: Sample restricted to employment periods for Austrian men, aged 15 to 50, blue collars. Only periods with more than one employment spell can be considered. Time period: 1989-2001.

Table 2: Individuals and experience of seasonal employment

	Wider definition		Restricted definition	
	%	N	%	N
No seasonal employment spells	72.37	1,286	88.67	1,534
At least 1 seasonal employment spell	27.63	491	11.33	196
Transitions between permanent and seasonal employment spells:				
No transitions	78.45	1,394	92.43	1,599
At least one transition	21.55	383	7.57	131
Always in seasonal employment	6.08	108	3.76	65
Always in permanent employment	72.37	1,286	88.67	1,534
Permanent to seasonal employment$^{(a)}$	10.86	193	3.00	52
Seasonal to permanent employment$^{(a)}$	10.69	190	4.56	79
Total	100.00	1,777	100.00	1,730

Notes: Distribution of individuals by type of employment spell and by number and type of transitions between seasonal and permanent employment spells. Yearly observations, time period: 1989-2001. Symbols: (a)= according to the first transition.

Table 3: Descriptive analysis of yearly employment observations, wider definition of seasonal employment

	Seasonal		Permanent		Total	
	%	N	%	N	%	N
Industry						
Agriculture	5.21	85	2.42	287	2.75	372
Manufacturing	13.37	218	43.92	5,216	40.23	5,434
Construction	34.58	564	20.97	2,490	22.61	3,054
Car sales	2.82	46	7.39	878	6.84	924
Wholesales	3.86	63	3.68	437	3.70	500
Retail	1.35	22	3.34	397	3.10	419
Hotel	16.25	265	4.14	492	5.60	757
Transport	11.96	195	5.41	643	6.20	838
Services	10.61	173	8.72	1,036	8.95	1,209
Region						
Vienna	11.96	195	13.20	1,568	13.05	1,763
Lower Austria	17.17	280	20.02	2,377	19.67	2,657
Burgenland	1.10	18	1.72	204	1.64	222
Upper Austria	11.40	186	22.21	2,638	20.91	2,824
Styria	24.28	396	20.22	2,401	20.71	2,797
Carinthia	6.19	101	5.25	623	5.36	724
Salzburg	9.01	147	6.10	724	6.45	871
Tirol	16.31	266	8.23	977	9.20	1,243
Vorarlberg	2.58	42	3.07	364	3.01	406
Starting month						
January	3.31	54	9.88	1,173	9.08	1,227
February	3.86	63	7.91	939	7.42	1,002
March	17.96	293	12.87	1,529	13.49	1,822
April	18.64	304	8.29	984	9.54	1,288
May	9.56	156	5.34	634	5.85	790
June	8.34	136	8.42	1,000	8.41	1,136
July	5.33	87	7.30	867	7.06	954
August	4.35	71	7.01	833	6.69	904
September	6.68	109	9.40	1,116	9.07	1,225
October	4.60	75	8.92	1,059	8.40	1,134
November	4.11	67	4.74	563	4.66	630
December	13.24	216	9.93	1,179	10.33	1,395
Total	100	1,631	100	11,876	100	13,507

Notes: Frequency distribution of person-year employment spells by industry, region and starting month of the spell. Time period: 1989-2001.

Table 4: Descriptive analysis of yearly employment observations, restricted definition of seasonal employment

	Seasonal		Permanent		Total	
	%	N	%	N	%	N
Industry						
Agriculture	6.29	44	2.44	288	2.65	332
Manufacturing	10.29	71	43.98	5,197	42.09	5,268
Construction	31.57	221	20.55	2,428	21.17	2,649
Car sales	0.57	4	7.44	879	7.06	883
Wholesales	4.57	32	3.71	439	3.76	471
Retail	1.57	11	3.44	406	3.33	417
Hotel	19.57	137	4.20	496	5.06	633
Transport	17.14	119	5.38	636	6.03	755
Services	8.43	59	8.87	1,048	8.85	1,107
Region						
Vienna	8.88	62	13.24	1,564	12.99	1,626
Lower Austria	16.76	117	19.91	2,353	19.74	2,470
Burgenland	0.43	3	1.73	205	1.66	208
Upper Austria	10.03	70	22.41	2,648	21.72	2,718
Styria	22.49	157	20.14	2,380	20.27	2,537
Carinthia	6.30	44	5.25	620	5.31	664
Salzburg	9.60	67	6.14	726	6.34	793
Tirol	22.78	159	8.14	962	8.96	1,121
Vorarlberg	2.72	19	3.04	359	3.02	378
Starting month						
January	1.29	9	9.71	1,147	9.24	1,156
February	3.01	21	7.83	925	7.56	946
March	24.93	174	12.91	1,526	13.58	1,700
April	26.50	185	8.10	957	9.13	1,142
May	6.59	46	5.28	624	5.35	670
June	5.16	36	8.47	1,001	8.29	1,037
July	2.29	16	7.36	870	7.08	886
August	0.72	5	7.02	830	6.67	835
September	2.44	17	9.48	1,120	9.09	1,137
October	1.72	12	9.05	1,069	8.64	1,081
November	3.87	27	4.78	565	4.73	592
December	21.49	150	10.01	1,183	10.65	1,333
Total	100	698	100	11,817	100	12,515

Notes: Frequency distribution of person-year employment observations by industry, region and starting month of the spell. Time period: 1989-2001.

Table 5: Descriptive statistics, yearly observations 1989-2001

Panel A: wider definition of seasonal employment	Seasonal		Permanent		Total	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Log monthly wage	9.8900	0.3247	10.0143	0.2926	9.9993	0.2994
Experience	3.5471	2.6504	4.9155	3.1292	4.7503	3.1075
Experience squared (/100)	0.1960	0.2542	0.3395	0.3798	0.3222	0.3699
Tenure	1.6350	1.7470	3.5153	2.7043	3.2883	2.6784
Tenure squared (/100)	0.0572	0.1271	0.1967	0.2871	0.1799	0.2766
% days in unemployment over the year	0.1907	0.1603	0.0240	0.0761	0.0441	0.1056
% days in unemployment over the year squared	0.0620	0.0801	0.0064	0.0322	0.0131	0.0449
% days in unemployment over the year within period	0.1656	0.1618	0.0064	0.0364	0.0256	0.0838
% days in unemployment over the year within period squared	0.0536	0.0819	0.0014	0.0129	0.0077	0.0353
Number of employment spells	1631		11876		13507	

Panel B: restricted definition of seasonal employment	Seasonal		Permanent		Total	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Log monthly wage	9.9298	0.3142	10.0133	0.2928	10.0086	0.2946
Experience	3.5122	2.4232	4.7913	3.1235	4.7200	3.1025
Experience squared (/100)	0.1820	0.2204	0.3271	0.3759	0.3190	0.3704
Tenure	2.2111	1.8157	3.5224	2.7093	3.4493	2.6842
Tenure squared (/100)	0.0818	0.1324	0.1975	0.2876	0.1910	0.2824
% days in unemployment over the year	0.2000	0.1508	0.0243	0.0776	0.0341	0.0926
% days in unemployment over the year squared	0.0627	0.0687	0.0066	0.0333	0.0097	0.0384
% days in unemployment over the year within period	0.1597	0.1522	0.0062	0.0362	0.0148	0.0614
% days in unemployment over the year within period squared	0.0486	0.0653	0.0013	0.0129	0.0040	0.0226
Number of employment spells	698		11817		12515	

Table 6: Baseline wage equation, wider definition of seasonal employment

Seasonal job	-0.0810**	-0.0477**	-0.0511**	-0.0484**	-0.0852**
	(0.0078)	(0.0066)	(0.0065)	(0.0064)	(0.0191)
Experience		0.0693**	0.0660**	0.0613**	0.0612**
		(0.0022)	(0.0060)	(0.0059)	(0.0059)
Experience squared (/100)		-0.3119**	-0.2845**	-0.2831**	-0.2846**
		(0.0179)	(0.0184)	(0.0182)	(0.0182)
Tenure		0.0091**	0.0091**	0.0062**	0.0058*
		(0.0024)	(0.0024)	(0.0023)	(0.0023)
Tenure squared (/100)		-0.0678**	-0.0671**	-0.0601**	-0.0554*
		(0.0223)	(0.0219)	(0.0215)	(0.0215)
Services (omitted)					
Agriculture				0.0987**	0.0790**
				(0.0190)	(0.0220)
Manufacturing				0.1273**	0.1253**
				(0.0098)	(0.0106)
Constructions				0.1451**	0.1279**
				(0.0109)	(0.0120)
Car sales				-0.0054	-0.0074
				(0.0152)	(0.0164)
Wholesales				0.0243	0.0088
				(0.0146)	(0.0159)
Retail				0.1000**	0.1164**
				(0.0163)	(0.0173)
Hotel				-0.0181	-0.0424*
				(0.0168)	(0.0186)
Transport				0.0034	0.0053
				(0.0135)	(0.0147)
Seasonal job & Services (omitted)					
Seasonal job & Agriculture					0.0757*
					(0.0359)
Seasonal job & Manufacturing					-0.0035
					(0.0231)
Seasonal job & Constructions					0.0670**
					(0.0211)
Seasonal job & Car sales					0.0114
					(0.0335)
Seasonal job & Wholesales					0.0727*
					(0.0349)
Seasonal job & Retail					-0.1768**
					(0.0461)
Seasonal job & Hotel					0.0834**
					(0.0261)
Seasonal job & Transport					0.006
					(0.0273)
Region dummies	no	no	yes	yes	yes
Year dummies	no	no	yes	yes	yes
Observations	13507	13507	13507	13507	13507
Number of individuals	1777	1777	1777	1777	1777
R-squared	0.01	0.32	0.35	0.37	0.37

Notes: Dependent variable is log of real gross monthly wages. Estimation is by fixed effects, yearly observations 1989-2001. Symbols: *= significant at 5% level, **= significant at 1% level.

Table 7: Baseline wage equation, restricted definition of seasonal employment

Seasonal job	-0.0287*	-0.0361**	-0.0406**	-0.0399**	-0.1160**
	(0.0128)	(0.0105)	(0.0103)	(0.0102)	(0.0410)
Experience		0.0664**	0.0555**	0.0528**	0.0540**
		(0.0022)	(0.0068)	(0.0067)	(0.0067)
Experience squared (/100)		-0.2898**	-0.2634**	-0.2651**	-0.2705**
		(0.0177)	(0.0181)	(0.0179)	(0.0179)
Tenure		0.0091**	0.0089**	0.0061**	0.0055*
		(0.0024)	(0.0023)	(0.0023)	(0.0023)
Tenure squared (/100)		-0.0707**	-0.0636**	-0.0568**	-0.0499*
		(0.0216)	(0.0212)	(0.0209)	(0.0208)
Services (omitted)					
Agriculture				0.1123**	0.1226**
				(0.0205)	(0.0219)
Manufacturing				0.1262**	0.1255**
				(0.0104)	(0.0105)
Constructions				0.1434**	0.1335**
				(0.0120)	(0.0122)
Car sales				0.0022	0.0044
				(0.0159)	(0.0161)
Wholesales				0.0389*	0.0266
				(0.0156)	(0.0158)
Retail				0.1044**	0.1190**
				(0.0167)	(0.0170)
Hotel				-0.036	-0.0489*
				(0.0191)	(0.0196)
Transport				0.0002	-0.0079
				(0.0148)	(0.0152)
Seasonal job & Services (omitted)					
Seasonal job & Agriculture					0.0007
					(0.0595)
Seasonal job & Manufacturing					-0.0259
					(0.0488)
Seasonal job & Constructions					0.0984*
					(0.0431)
Seasonal job & Car sales					-0.0943
					(0.0885)
Seasonal job & Wholesales					0.2470**
					(0.0602)
Seasonal job & Retail					-0.2928**
					(0.0777)
Seasonal job & Hotel					0.1007*
					(0.0480)
Seasonal job & Transport					0.1239*
					(0.0483)
Region dummies	no	no	yes	yes	yes
Year dummies	no	no	yes	yes	yes
Observations	12515	12515	12515	12515	12515
Number of individuals	1730	1730	1730	1730	1730
R-squared	0.00	0.33	0.36	0.38	0.39

Notes: Dependent variable is log of real gross monthly wages. Estimation is by fixed effects, yearly observations 1989-2001. Symbols: *= significant at 5% level, **= significant at 1% level.

Table 8: Unemployment equation

	% days unemployed over the year		% days unemployed over the year, within period	
	Wider definition	Restricted definition	Wider definition	Restricted definition
Seasonal job	0.1055**	0.0504	0.1300**	0.0859**
	(0.0152)	(0.0365)	(0.0116)	(0.0227)
January (omitted)				
February	0.0110*	0.0131**	0.0052	0.0038
	(0.0051)	(0.0050)	(0.0039)	(0.0031)
March	0.0193**	0.0215**	0.0085*	0.0082**
	(0.0049)	(0.0048)	(0.0037)	(0.0030)
April	0.0179**	0.0166**	0.0120**	0.0111**
	(0.0053)	(0.0052)	(0.0040)	(0.0032)
May	0.0158**	0.0177**	0.0077	0.0089*
	(0.0059)	(0.0057)	(0.0045)	(0.0036)
June	0.0047	0.0076	0.0016	0.0026
	(0.0055)	(0.0054)	(0.0042)	(0.0033)
July	0.0093	0.0088	0.0073	0.0065*
	(0.0054)	(0.0052)	(0.0041)	(0.0032)
August	0.0118*	0.0141**	0.0038	0.0014
	(0.0054)	(0.0052)	(0.0041)	(0.0033)
September	-0.0014	0.0056	-0.0008	0.0015
	(0.0052)	(0.0051)	(0.0039)	(0.0031)
October	0.0045	0.0024	-0.0084*	-0.0065*
	(0.0053)	(0.0052)	(0.0041)	(0.0032)
November	-0.0107	-0.0085	-0.0047	-0.0049
	(0.0065)	(0.0064)	(0.0050)	(0.0040)
December	-0.0094	-0.0080	-0.0055	-0.0060
	(0.0054)	(0.0052)	(0.0041)	(0.0033)
Seasonal job & January (omitted)				
Seasonal job & February	0.0453**	0.0744*	0.0345**	0.0150
	(0.0164)	(0.0370)	(0.0125)	(0.0230)
Seasonal job & March	0.0390**	0.0717*	0.0503**	0.0737**
	(0.0137)	(0.0338)	(0.0104)	(0.0210)
Seasonal job & April	0.0784**	0.1237**	0.0803**	0.1048**
	(0.0138)	(0.0337)	(0.0105)	(0.0209)
Seasonal job & May	0.0923**	0.1454**	0.1022**	0.1196**
	(0.0146)	(0.0345)	(0.0111)	(0.0215)
Seasonal job & June	0.0714**	0.1262**	0.0595**	0.1157**
	(0.0147)	(0.0355)	(0.0112)	(0.0221)
Seasonal job & July	0.0409**	0.0720	0.0393**	0.0899**
	(0.0155)	(0.0393)	(0.0118)	(0.0244)
Seasonal job & August	0.0368*	0.0619	0.0156	0.0419
	(0.0163)	(0.0501)	(0.0124)	(0.0311)
Seasonal job & September	0.0153	-0.0599	0.0237*	-0.0176
	(0.0151)	(0.0431)	(0.0115)	(0.0268)
Seasonal job & October	0.0303	0.0946	0.0340**	0.0416
	(0.0167)	(0.0602)	(0.0127)	(0.0374)
Seasonal job & November	0.0330	0.0825*	0.0159	0.1161**
	(0.0177)	(0.0382)	(0.0135)	(0.0237)
Seasonal job & December	0.0641**	0.1075**	0.0506**	0.0855**
	(0.0146)	(0.0330)	(0.0111)	(0.0205)
Observations	13507	12515	13507	12515
Number of individuals	1777	1730	1777	1730
R-squared	0.21	0.14	0.30	0.19
F-test				
season-month interactions (11 dof)	8.61	7.38	16.51	12.30
month, season-month interactions (22 dof)	10.12	7.11	15.28	10.26

Notes: Dependent variable is the percentage of time unemployed over the employment period. Estimation is by fixed effects, yearly observations 1989-2001. Other variables included but not shown: experience and experience squared, tenure and tenure squared, industry dummies, industry dummies interacted with the indicator of seasonal employment (service industry dummy is omitted), year dummies and regional dummies. The seasonal job coefficient refers to seasonal employment in the service sector. Symbols: *= significant at 5% level, **= significant at 1% level.

Table 9: Compensating differential for seasonal employment, wider definition

Panel A: % days unemployed over the year

	FE	FE/IV	FE	FE/IV	FE/IV
Seasonal job	-0.0951**	-0.0494	-0.1031**	-0.0414	0.0168
	(0.0204)	(0.0461)	(0.0211)	(0.0469)	(0.0706)
(1) Seasonal & % unemployment	0.0425	-0.1601*	0.1517	-0.4344**	-0.4876**
	(0.0314)	(0.0681)	(0.0800)	(0.1480)	(0.1564)
(2) Seasonal & % unemployment squared			-0.2280	0.6579*	0.8077*
			(0.1535)	(0.3062)	(0.3408)
(3) Seasonal & standard deviation					-3.8091
of predicted % unemployment					(3.7942)
Compensating diff. due to (1)		-0.0356		-0.0965	-0.1083
Compensating diff. due to (2)				0.0555	0.0681
Compensating diff. due to (2)+(3)					0.0078
Observations	13507	13507	13507	13507	13507
Number of individuals	1777	1777	1777	1777	1777
R-squared	0.37	0.37	0.37	0.37	0.37

Panel B: % days unemployed over the year within period

	FE	FE/IV	FE	FE/IV	FE/IV
Seasonal	-0.0814**	-0.0432	-0.0793**	-0.0039	0.0408
	(0.0199)	(0.0512)	(0.0204)	(0.0595)	(0.0850)
(1) Seasonal & % unemployment	-0.0189	-0.2057	-0.0501	-0.8847*	-0.9690*
	(0.0293)	(0.1408)	(0.0705)	(0.4393)	(0.4694)
(2) Seasonal & % unemployment squared			0.0655	1.8833	2.1271
			(0.1343)	(1.1545)	(1.2545)
(3) Seasonal & standard deviation					-2.6983
of predicted % unemployment					(4.7258)
Compensating diff. due to (1)		-0.0387		-0.1666	-0.1825
Compensating diff. due to (2)				0.0804	0.0908
Compensating diff. due to (2)+(3)					0.0583
Observations	13507	13507	13507	13507	13507
Number of individuals	1777	1777	1777	1777	1777
R-squared	0.37	0.37	0.37	0.37	0.37

Notes: Dependent variable is log of real gross monthly wages. Estimation is by fixed effects, yearly observations 1989-2001. Bootstrapped standard errors shown in parenthesis for the IV estimates. The compensating wage differential is calculated at the mean of the predicted values of unemployment. Other variables included but not shown: experience and experience squared, tenure and tenure squared, industry dummies, industry dummies interacted with the indicator of seasonal employment (service industry dummy is omitted), year dummies and regional dummies. The seasonal job coefficient refers to seasonal employment in the service sector. (1) corresponds to the parameter $-\gamma$, (2) corresponds to the parameter $\frac{1}{2e}$, and (3) corresponds to the parameter $\frac{1}{2}r$ in equation (9). Symbols: *= significant at 5% level, **= significant at 1% level.

Table 10: Compensating differential for seasonal employment, restricted definition

Panel A: % days unemployed over the year

	FE	FE/IV	FE	FE/IV	FE/IV
Seasonal job	-0.1218**	-0.0853	-0.1405**	-0.0793	0.0352
	(0.0425)	(0.1082)	(0.0437)	(0.1080)	(0.1300)
(1) Seasonal & % unemployment	0.0307	-0.1863	0.2782	-0.3993	-0.4764*
	(0.0573)	(0.1199)	(0.1480)	(0.2095)	(0.2219)
(2) Seasonal & % unemployment squared			-0.5517	0.5330	0.7184
			(0.3042)	(0.4242)	(0.4610)
(3) Seasonal & standard deviation					-4.1610
of predicted % unemployment					(2.7321)
Compensating diff. due to (1)		-0.0429		-0.0919	-0.1097
Compensating diff. due to (2)				0.0479	0.0645
Compensating diff. due to (2)+(3)					-0.0303
Observations	12515	12515	12515	12515	12515
Number of individuals	1730	1730	1730	1730	1730
R-squared	0.39	0.39	0.39	0.39	0.39

Panel B: % days unemployed over the year within period

	FE	FE/IV	FE	FE/IV	FE/IV
Seasonal	-0.0986*	-0.0681	-0.1170**	-0.0571	0.0551
	(0.0419)	(0.1174)	(0.0426)	(0.1267)	(0.1598)
(1) Seasonal & % unemployment	-0.0982*	-0.2923	0.2003	-0.4702	-0.8142
	(0.0487)	(0.2838)	(0.1317)	(0.8999)	(0.9873)
(2) Seasonal & % unemployment squared			-0.7470*	0.5468	1.4797
			(0.3062)	(2.6830)	(2.9124)
(3) Seasonal & standard deviation					-5.198
of predicted % unemployment					(4.4287)
Compensating diff. due to (1)		-0.0513		-0.0825	-0.1429
Compensating diff. due to (2)				0.0192	0.0519
Compensating diff. due to (2)+(3)					-0.0217
Observations	12515	12515	12515	12515	12515
Number of individuals	1730	1730	1730	1730	1730
R-squared	0.39	0.39	0.39	0.39	0.39

Notes: Dependent variable is log of real gross monthly wages. Estimation is by fixed effects, yearly observations 1989-2001. Bootstrapped standard errors shown in parenthesis for the IV estimates. The compensating wage differential is calculated at the mean of the predicted values of unemployment. Other variables included but not shown: experience and experience squared, tenure and tenure squared, industry dummies, industry dummies interacted with the indicator of seasonal employment (service industry dummy is omitted), year dummies and regional dummies. The seasonal job coefficient refers to seasonal employment in the service sector. (1) corresponds to the parameter $-\gamma$, (2) corresponds to the parameter $\frac{1}{2e}$, and (3) corresponds to the parameter $\frac{1}{2}r$ in equation (9). Symbols: *= significant at 5% level, **= significant at 1% level.