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Abstract

We study the evolution and cyclical dependency of the cross sectional distribution of firm level job creation rates from 1975 to 2004 for the Austrian private sector. We find that the share of firms that does not adjust has declined over time, but that the share of entries, exits, growing and declining firms increased. The share of firms adjusting is higher in upswings than in downturns and the higher order moments of the job creation distribution follow distinct cyclical patterns. The smallest firms and firms at the extremes of the growth rate distribution are largely unaffected by the business cycle.

1 Introduction

The interaction between firm level and macro-economic dynamics has received considerable attention in recent empirical business cycle research. A large number of papers use micro-level employment data to make inferences about the structure and nature of firm level adjustment over the business cycle. The main lessons from this literature are that employment adjustment at the plant level is both lumpy and occasional and that heterogeneity at the firm level is a preponderating characteristic of employment growth (see: Davis and Haltiwanger, 1999; Davis et al., 1996; King and Thomas, 2006). While these stylised facts are by now uncontroversial less is known about the systematic firm level factors underlying the heterogeneity of firm's adjustment behaviour. Few papers address this topic, with the main body of work (e.g. Nilsen and Schiantarelli, 2003; Higson et al., 2002) looking at firm size and long run growth performance as two possible explanations.

In this paper we are also interested in the nexus between firm size and growth performance and firm level employment adjustment. Our aims in this respect are twofold. First, we establish a set of stylized facts concerning the evolution of the higher order moments of the cross sectional distribution of job creation rates over the business cycle. This is interesting because the standard deviation of this distribution provides information on the systematic variations in firm level heterogeneity over the business cycle. Changes in skewness of this distribution indicate cyclicality in the shares of firms growing faster or slower than the mean, and changes in the kurtosis indicate whether cyclical fluctuations in employment growth are primarily associated with changes in the growth performance of firms in the medium ranges of this distribution.

Second, we are interested in whether these changes are related to firm characteristics. We focus on regularities in responses of firms of differing size and growth rates. Previous literature has also found these variables important predictors of other aspects of firm behaviour. In this respect aside from providing descriptive evidence, we estimate a two stage Heckman type ordered logit model of firm level employment adjustments, in which firms of different sizes may react differently to aggregate employment changes. Our paper is thus closely related to the literature studying the interaction between firm level growth and aggregate dynamics over the business cycle (e.g. Davis et al., 1996; Varejao and Portugal, 2007). In particular methodologically we draw on a set of recent contributions by Nilsen and Schiantarelli (2003) and by Higson et al. (2002, 2004) and Döpke et al. (2005).

We, however, differ from these contributions by focusing on the impact of aggregate employment growth on firm level job creation rates rather than on adjustment costs as Nilsen and Schiantarelli (2003) and by considering job creation rates rather than sales growth as Higson et al. (2002, 2004) and Döpke et al. (2005). In addition we use a large unbalanced dataset that covers the universe of private sector firms which registered at least one dependent employee in the years form 1975 to 2004 with the Austrian Social Security System. This makes a significant difference to previous studies since the broad coverage of firms makes our evidence quite general: We can explicitly consider firm entry and exit and in contrast to Higson et al. (2002, 2004) and Döpke et al. (2005) our findings are not limited to (larger) publicly traded firms. This is important in the light of the results obtained by Davis et al. (2007) which suggest that a substantial difference in the volatility and dispersion of firm growth rates for privately held and publicly traded firms.

2 Shocks and aggregate and firm-level employment growth

As a starting point for our analysis we consider the simple analytic framework provided by Higson et al. (2002). Firms are assumed to produce output according to a standard constant elasticity of scale production function in a stochastic environment, where for expository reasons we assume that firms are subject to a firm-specific and and an aggregate shock only. Firms may react in different ways to these shocks. The overall shock experienced by firm i in period t is thus

$$\tilde{\epsilon_{i,t}} = \beta_i \eta_t + \epsilon_{i,t}, \tag{1}$$

where $\epsilon_{i,t}$ is the firm-specific shock, η_t the aggregate shock and β_i is the individual response of firm i to the aggregate shock.[1].

From equation (1) it is clear that aggregate shocks may have different impacts on different firms as captured by β_i. This individual response may vary across firms in a systematic way. One possibility, which we explore below, is that there are systematic differences in the response to the aggregate shock by small and large firms. For example, large firms may decline faster in downturns. A second possibility we consider is that the growth response of a firm to an aggregate shock depends of its position in the distribution of growth rates. For example, firms with extreme growth rates may be less affected by a business cycle downturn than firms with average growth rates.

When we consider employment growth we, however, cannot translate these shocks directly into firm level employment growth, as a by now substantial literature (e.g. Varejao and Portugal, 2007; Hammermesh, 1989) shows that due to adjustment costs a large number of firms does not adjust employment at a given point in time. In line with Caballero et al. (1997) we thus assume that at each point in time each firm in our sample can be characterised by a measure of labour shortage z_{it}, which is defined as the difference between the desired number of workers in a frictionless economy (e^*_{it}) and the actual employment stock (e_{it}) (i.e. $z_{it} = e^*(\tilde{\epsilon_{i,t}})_{it} - e_{it}(\tilde{\epsilon_{i,t}})$) and that the optimal adjustment strategy of a firm consists of either adjusting employment completely (i.e by z_{it}) if adjustment costs are smaller than the opportunity costs of not adjusting or not adjusting at all (see Caballero and Engel (1993) for a theoretical model which predicts this behavior). Thus to present a complete description of firms' adjustment behavior over the business cycle we have to consider both the share of firms adjusting as well as the size of adjustment of those firm that do adjust. We consider this selection problem explicitly in the econometric analysis in section 6.

3 Data and Measurement

The data we use to measure firm level employment stem from the Austrian Social Security files. They contain employment stocks a for all private sector firms with at least one employee for the time period from the 4th quarter of 1974 to the 4th quarter of 2004.[2] We primarily focus on quarterly micro-data to avoid excess smoothing through temporal aggregation (see Hammermesh 1993 and Varejao and Portugal 2007). However, we also report results for annual data as an additional robustness check. Compared to the other data sets used in the literature ours have the advantage of a wide coverage. We have available information on all business units for the Austrian private sector starting from the size of one employee.[3] This, however, comes at the price of limited information on firms. We lack all information on firms (e.g. productivity, sales or profitability) other than industry affiliation and region of operation. It is also not entirely clear whether the business units reporting are enterprises or establishments, since the anonymous firm numbers in the social security files identify administrative accounts. It is left to discretion of the individual firm whether it chooses to report at the enterprise or establishment level (or a mixture of both). However, Stiglbauer (2003) argues that the majority of data will be on the enterprise level, since firms reduce their administrative burdens when reporting social security contributions at enterprise level.

We measure firm level employment growth by the job creation rate as proposed by Davis et al. (1996):

$$JCR_{it} = (E_{it} - E_{it-1})/AVE_{it}. \tag{2}$$

with JCR_{it} the job creation rate of firm i in period t, E_{it} the employment level and AVE_{it} average employment, which is also used as the definition of firm size, and is defined as

$$AVE_{it} = \frac{(E_{it} + E_{it-1})}{2} \tag{3}$$

As suggested by Davis et al. (1996) this measure has the advantage that growth rates of employment are defined even for firms which have no employees at the beginning or the end of a period. Firms which had no employees at the beginning of a period, which we refer to as entries, have a job creation rate of 2 and firms that have no employees at the end of the period, which we call exits, have a job creation rate of -2. Furthermore, in contrast to conventional growth rates that have a support in the interval $[-1, \infty]$ job creation rates have a support in the interval $[-2, 2]$. The resulting distribution is symmetric and not distorted as the standard growth rate distribution by the asymmetry of the distribution due to a few fast growing firms.[4] One disadvantage of this measurement of employment growth, however, is that firm start-ups and closures are associated with extremely high growth rates, which may affect interference and conclusions (Foote, 2007). Therefore we also consider a growth rate distribution which excludes entry and exit, as well as a weighted job creation rate distribution, where the job creation rate is weighted by firm size. Furthermore we also report effects for entry and exit separately.

3.1 Descriptive Statistics and the Job Creation Distribution

As amply documented in previous previous research on the firm size distribution in Austria (see Huber and Pfaffermayer 2007; Coad and Hölzl 2009) most of the 170.000 to 190.000 firms registered each year in our data are small. Over a quarter of the firms have only one employee and only around 1% have more than 150 employees at any point in time. Furthermore, average firm sizes are larger in 2004 than in 1974 (the average firm size was 10.7 employees in 1974 and increased to 12.3 in 2004) and median firm sizes increased from 2 employees to 3.

[Table 1 about here.]

[Figure 1 about here.]

Table 1 reports the summary statistics on the distribution of annual job creation rates and Figure 1 presents the distribution of quarterly firm level job creation rates. It displays the familiar pattern of a tri-polar distribution with three spikes located at the growth rates of -2, 0, and 2, which are associated with exit, inactivity and entry, respectively. The patterns show a remarkable similarity between annual and quarterly data. Between 60% and 65% of the firms do not adjust employment within a quarter and over a year this applies to 40% to 50%. In addition 3% to 7% of the firms end or begin a quarter with no employees (9% to 11% in annual data). This clearly confirms that employment changes tend to be lumpy and rare and the resulting distribution of job creation rates is tri-polar with a large share of firms showing no change in employment or entering or exiting.

[Table 2 about here.]

As additional piece of evidence table 1 also presents the moments of the annual growth rate distribution and table 2 descriptive statistics for the quarterly growth rate distribution. As can be seen the unweighted cross-sectional distribution is slightly left skewed - especially if we exclude entries and exits - while the weighted job creation rate distribution is right skewed and both weighted and the unweighted distributions are leptokurtic. This indicates that at any point in time during the three decades considered there was a larger number of (mostly small) firms with growth rates below the mean and a smaller number of (larger) firms with growth rates above the mean and that - even when excluding entries and exits - each year there were larger numbers of very rapidly growing and declining firms than would be expected from a normal distribution.[5] Thus the moments of the job creation rate distribution are remarkably stable over time. This connects well with the recent literature on the distribution of growth rates in the industrial organization and econophysics literature, which emphasizes the relative invariance of the growth rate distribution over time but also the invariance to disaggregation that does not hold for the firm size distribution (Stanley et al., 1996; Bottazzi and Secchi, 2006; Dosi, 2007).

3.2 Long-run Trends and Seasonality

Despite this stable shape of the job creation rate distribution there is also substantial variance in the higher order moments. In particular table 1, figure 2 and the trend regression results in table 3 suggest some interesting long run trends in our data. The share of firms entering and exiting the market and to a lesser degree of those growing and declining has steadily increased in the period from 1975 to 2004 at the expense of a decline in the share of inactive firms. In 1975 the share of inactive firms in the economy was - using quarterly data - at a level well above 60% and exit and entries were at around 4%. By 2004 the share of inactive firms had declined to well below 60%, while the share of entries and exits exceeded 6%. Similarly, in all versions of the distribution considered in table 3 a significant negative trend is found for the kurtosis and a significant positive trend for the standard deviation. Thus the distribution has become increasingly dispersed but less leptokurtic over time. For the skewness and the mean, by contrast, we observe significant trends only for the annual job creation rate distribution. Here the weighted growth rate distribution exhibits increasing mean job creation rates and decreasing skewness, while the unweighted growth rate distributions are characterized by a decreasing mean (which is however statistically significant only when excluding entry and exit) and a positive trend coefficient on the skewness.

[Table 3 about here.]

Furthermore figure 2, which displays the moments of the growth rate distribution and adjustment hazards on a quarterly basis suggests substantial seasonality in all of the higher order moments of the quarterly growth rate distribution: The average job creation rate as well as the kurtosis are highest in the third quarter of a year and lowest in the second quarter. The standard deviation by contrast peaks in the first quarter and attains a minimum in the third quarter, while the skewness attains a maximum in the third quarter and a minimum in the first. Similar seasonality can also be observed for the share of entering, exiting, growing, declining and inactive firms. Here most exits occur at the end of the year, while firm entries occur at the beginning. The share of growing firms is typically highest in the second and lowest in the fourth quarter when also aggregate employment growth peaks, while for the share of declining firms figures are highest in the fourth quarter and lowest in the second quarter.

[Figure 2 about here.]

4 The job creation rate distribution over the business cycle

Aside from trends and seasonality, the main concern of this paper is with cyclical changes, however. Thus given the evidence of both seasonality and long run trends, we detrend and deseasonalise our data using the Baxter and King (1999) band pass filter allowing for an upper bound of 32 quarters and a lower bound of 6 quarters with a truncation of 12 leads and lags for quarterly data. For annual data we use an upper bound of 8 years, a lower bound of 2 years and 3 leads and lags. Table 4 reports standard deviations of the indicators and cross correlations of the filtered series with filtered aggregate employment growth as an indicator series for the state of the business cycle. The standard deviation of the cyclical component of all indicators considered is larger than that of aggregate employment. This underlines the importance of cyclical variation for both the share of adjusting firms as well as the moments of the growth distribution over the business cycle.

In addition, both in annual as well as quarterly data the share of growing firms is strongly procyclical, while the share of entries is weakly procyclical. Firm entry lags behind aggregate employment growth by up to 3 quarters. The share of declining firms, by contrast, is countercyclical and firm exit is insignificantly correlated with aggregate employment growth for both quarterly and annual data. Also in quarterly data the procyclicality of the share of growing firms is stronger than the countercyclicality of the share of declining firms, so that the share of inactive firms is also countercyclical and leads aggregate employment growth by one quarter. This corroborates results by Davis and Haltiwanger (1999), who also find some cyclical asymmetry between job creation and job destruction and suggests that in times of high employment growth a larger share of firms changes employment levels than in times of slow employment growth. As shown by Cooper et al. (1999) this is consistent with a theoretical model in which there are substantial fixed costs to employment adjustment.

[Table 4 about here.]

When considering the job creation rate distribution we find that, as expected, the cyclical component of the mean of the job creation rate is positively associated with cyclical component of aggregate employment growth for all variants of the job creation rate distribution considered (see table 4). Results for the other higher moments, however, depend more strongly on which of the versions of the job creation rate distribution we focus on. In particular when considering the unweighted job creation rate distribution including entry and exit, we find that aside from a small significant procyclical effect on its kurtosis, which is likely to be related with the procyclicality of firm entry, the higher order moments of the job creation rate distribution remain insignificantly correlated with aggregate employment growth. Thus in this case the large share of entries and exits (of in particular small firms) discussed in the last section makes it difficult to identify any cyclical changes in the higher moments of the job creation rate distribution.

Considering the unweighted job creation rate distribution excluding entry and exit we see, however, that - aside from the mean shifting upwards in times of high employment growth - the distribution is also significantly less left skewed in upturns while its variance increases with little effect on its kurtosis. This suggests that when giving firms of all sizes equal weight firms located at the left of the growth rate distribution (i.e firms with low or moderately negative growth rates) are less numerous in upturns but more numerous in downturns and react more strongly to the aggregate dynamics. This pattern is able to generate a countercyclical standard deviation and is suggested also by the cyclical behaviour of the shares of growing and declining firms.

Finally, the pattern for the firm size weighted job creation rate distribution is similar to that of the unweighted distribution excluding entry and exit with the exception of the procyclical kurtosis. This suggest that here too firms located at the left of the growth rate distribution (i.e firms with very low or negative growth rates) are less numerous in upturns and thus react more strongly to the aggregate dynamics. These results, however, also suggest that when giving more weight to large firms, the tails of the job creation rate distribution (i.e. both fast and slow growing firms) are more sensitive to the cyclical variation.[6]

In sum these results thus first of all suggest that aside from shifts in the average job creation rate, changes in aggregate employment growth also have an impact on the shape of the job creation rate distribution. In particular, the mean of the job creation rate distribution is positively associated with aggregate employment growth and in most cases its kurtosis is weakly procyclical (especially for larger firms) while its standard deviation is countercyclical using quarterly data. These results lead to the expectation that different parts of the job creation rate distribution react quite differently to cyclical changes in aggregate employment growth. They suggest that the smallest firms - that make up the mass observations in the unweighted distribution - do not react very much to the business cycle, and that firms at the ends of the job creation rate distribution are largely unaffected by the business cycle.[7]

5 Firm Heterogeneity

Given this evidence we turn to the heterogeneity of employment growth and provide further evidence for the two stories told earlier (i) that regularities in the employment adjustment behavior between small and large firms are an explanation for the greater variability in the higher moments of the weighted than the unweighted job creation distribution and (ii) that there is substantial asymmetry in the employment adjustment for rapidly growing and declining firms and firms in the middle ranges of the growth rate distribution.

5.1 Firm Size, Employment Adjustment and Aggregate Employment Dynamics over the Business Cycle

One question is to what degree trends and cyclical characteristics of job creation rates differ for firms of different sizes. The evidence from the adjustment cost literature (e.g. Varejao and Portugal 2007; Hammermesh 1989) suggests that smaller firms do not adjust their employment as often as larger firms. Figure 3 thus plots the average shares (i.e. the average across all time periods) of firms that enter, exit, grow, decline or do not adjust by firm size groups. This figure clearly confirms that the share of adjusting firms is increasing in firm size. While on average over 70% of the firms with an average firm size of between 0 and 5 employees do not change their employment over one quarter, only 1% of the firms with more than 500 employees do not. Furthermore, the higher non-adjustment probability of small firms arises even though most newly entering and exiting firms are small. On average around 7% of the firms of the size of between 0 to 5 employees in our sample enter or exit the market over a quarter. For large firms with more than 500 employees this share is below 0.1%. Adjustment thus is rare for small firms. This in turn can be taken as indication that non-convexities of adjustment costs are more important for small firms due to indivisibilities associated to their small size.

[Figure 3 about here.]

In addition we run regressions of the share of inactive, exiting, entering, growing and declining firms on a trend term for each of the size groups considered. The results (in table 5) indicate that the downward trend in the aggregate share of inactive firms is primarily due to a reduction of the share of inactive small firms over time. In fact, small firms (up to 10 employees) are the only ones that show a significant negative trend in the share of inactive firms. These firms, however, account for around 70% of all firms in our data and drive the aggregate picture. Similarly, the increase in entry and exit affected the smaller size classes, only. Small firms with less than 5 employees have by far the largest trend coefficient for the share of entering firms and trend coefficients are statistically insignificant for all size classes covering firms with more than 300 employees. Evidence for trends in the share of growing and declining firms, by contrast, suggests a positive trend for the smallest firms (with up to 5 employees), but a significantly negative trend for larger firms (in particular for firms with 200 to 450 employees). Thus once more the upward trends in adjustment frequency as well as entry and exit found in aggregate data is primarily due to increased adjustment frequencies of small firms.

[Table 5 about here.]

In figure 4 we plot the correlation coefficients of the cyclical component[8] of the share of inactive firms as well as the shares of newly entering, exiting, growing and declining firms by firm size with the cyclical component of aggregate employment growth. As can be seen the shares of entering and exiting firms are only weakly correlated with aggregate employment growth for all firm size groups. Thus there are no statistically significant and economically relevant differences regarding the cyclicality of entry and exit across size classes. On the other hand there are statistically significant differences in the cyclical behavior of of the share of declining and growing firms. The correlation coefficient is statistically significant for all size groups except the smallest firms (between 0 and 10 employees). This is consistent with adjustment cost models that assume substantial size dependent adjustment costs in employment adjustment. The correlation coefficient for the job creation rate is also statistically significant for all size groups except for the very smallest firms, but falls slightly - but not statistically significantly - in firm size for firms with more than 10 employees. This thus also suggests that the smallest firms in the economy are only little affected by the business cycle.

[Figure 4 about here.]

[Figure 5 about here.]

5.2 Firm Growth and Aggregate Employment Dynamics over the Cycle

Our evidence on the adjustment frequency suggests that the most extreme forms of job creation and destruction (i.e. entry and and exit) are less responsive to the business cycle. Earlier we conjectured that the countercyclical standard deviation of the job creation distribution can be explained by associated changes in the skewness (for the unweighted distribution) and the kurtosis (the weighted distribution), which emerge when firms with below and close to median growth rates respond more to the business cycle than firms with above median growth rates. In addition the responsiveness of the kurtosis to the cyclical component of aggregate growth for the unweighted growth rate distribution suggests that firms at the extremes of the job creation rate distribution react less strongly to the business cycle. Thus we follow Higson et al. (2002) and Higson et al. (2004) in considering the individual percentiles of the job creation rate distribution.

We proceed as follows: For each time period considered we sort observations by job creation rates and calculate percentiles of the distribution. Then we correlate each of the resulting time series of percentiles of the job creation rates with aggregate employment growth rates. The correlation coefficients reported in figure 5 show that firms with extreme growth events (both expansion and decline) are least reactive to the business cycle, while growth rates in the middle ranges of the job creation rate distribution react strongly to the business cycle.[9] Our findings thus extend those of Higson et al. (2002, 2004) and Döpke et al. (2005) to employment growth. This suggests that extreme growth events are driven primarily by firm-specific shocks, while averagely growing firms contribute most to aggregate employment changes.

6 Parametric Analysis

Summarizing our results so far we find that there have been important long run trends in both the adjustment hazard as well as the shape of the job creation rate distribution in the last 30 years in Austria. In addition the share of inactive and declining firms in the economy as well as the standard deviation of the job creation rate distribution is countercyclical, while the share of growing firms as well as the mean, skewness and to a lesser extent also the kurtosis and the share of entries is procyclical. In addition, there is clear indication that the adjustment probability is asymmetric with respect to growing and declining firms over the business cycle. Substantial differences emerge with respect to the adjustment behavior of firms of different size and growth rates. The smallest firms and firms at the extremes of the growth rate distribution are largely unaffected by the business cycle and there is some asymmetry with regard to the response to the business cycle related to the position of the firm in the growth rate distribution.

In order to corroborate these findings we estimate an econometric model of the determinants of the adjustment hazard and size of adjustment at the firm level. The primary goal is to assess the robustness of our findings by providing more rigorous complementary evidence. When moving to the firm level we have to take into account the the potential selection problem associated with the potential endogeneity of a firm's decision to adjust employment or not. Therefore we implement a two-step selection model first proposed by Nilsen et al. (2007) in a similar setting. The first step provides an estimate of the adjustment probability while the second step focuses on adjustment size. In the first step we estimate an ordered probit selection equation which excludes all entering and closing firms[10] but allows us to differentiate between inactive, growing and declining firms. In the second step - to account for potential asymmetries between firms with increasing or decreasing employment - we differentiate between positive and negative job creation rates. The model we estimate is given by the following two equations:

$$\ln(JCR_{it}) = \begin{cases} \beta_1 X_{1it} + \mu_{1it} & if \quad I_{jit} = -1 \\ \beta_2 X_{2it} + \mu_{2it} & if \quad I_{jit} = 1 \end{cases} \tag{4}$$

and

$$I_{jit} = \begin{cases} -1 & if \quad \gamma Z_{it} + \xi_{it} < 0 \\ 0 & if \quad 0 < \gamma Z_{it} + \xi_{it} < u_1 \\ 1 & if \quad u_1 < \gamma Z_{it} + \xi_{it} < u_2 \end{cases} \tag{5}$$

where I_{jit} is a variable which takes on the value 0 if the firm does not change its employment in the time period from t to t-1, 1 if the firm increases employment and -1 if it reduces employment , X_{it} and Z_{it} are two sets of explanatory variables and ξ_{it} and μ_{jit} are two random variables with $\xi_{it} \sim N(0,1)$, $\mu_{jit} \sim N(0, \sigma_{jit})$, and $corr(\mu_{jit}, \xi_{it}) = \rho_j$ for $j \in (1,2)$ and γ_j and β are the parameters to be estimated.

6.1 Adjustment Probability

In the first step we estimate equation (5). We include (the logged) contemporaneous aggregate employment growth and (since descriptive evidence suggests differences in adjustment between different firm sizes) an interaction between the (log of) contemporaneous aggregate employment growth with log firm size and its square as covariates. In addition we include firm age and its square as well as (log) firm size and its square to control for effects of firm size and firm age on firm growth, and a set of (NACE 2 digit) industry dummies interacted with seasonal dummies, to account for industry specific growth patterns and industry-specific seasonality in the data.

The first column of table 6 presents the results of first stage estimation. The coefficients of the control variables imply that the probability of adjustment initially increases with firm size but decreases with firm age. Thus younger and larger firms adjust employment upwards more often than older and smaller firms. These effects are, however, not linear. The coefficient on the squared age suggests that the increase of upward adjustment probability declines with age with the turning point at an age of 81 years. By contrast the coefficient on log firm size squared suggests that from a firm size of 6 employees onwards larger firms start to have lower upward adjustment probabilities, which suggests that in general large firms grow less strongly than small firms after a size of 6 employees. This finding is consistent with theoretical models of firm growth (e.g. Jovanovic 1982, see Sutton 1997 for survey).

Turning to the results with respect to aggregate employment growth we find that - somewhat surprisingly - for small firms the probability of an upward movement is negatively correlated with aggregate employment growth (i.e. countercyclical), but increases with a decreasing rate as firm size increases. Figure 6 plots the total coefficient including the quadratic term by firm size. From this plot we see that this negative coefficient applies only to firms with one employee.[11] Starting from a firm size of 2 employees onward the probability of an employment adjustment is increasingly positively correlated with aggregate employment changes for the relevant range of the firm size distribution.

[Table 6 about here.]

[Figure 6 about here.]

6.2 Size of Adjustment

In the second step we estimate equation (4) separately for positive and negative job creation rates including (log) contemporaneous aggregate employment growth and (log) aggregate employment growth interacted with log firm-size and its square as covariates. In order to control for the fact that firms with a lower adjustment frequency are likely to have larger adjustments we include an indicator for the frequency of moves of the firm[12], its square and cube as well as the time elapsed since the last adjustment period. The correction term for selectivity is denoted by λ. In addition we include the control variables firm age and firm size as well as (NACE 2 digit) industry dummies interacted with seasonal dummies that were also used in the first stage as controls. In order to identify the model we exclude age squared.

The results are reported in columns 2 and 3 of table 6 and figure 6 plots the total effect of aggregate employment growth on firm size including the squared term. Starting first with the coefficients for aggregate employment growth we can see that (conditional on an upward expansion of employment) aggregate employment growth increases the size of positive adjustment. This procyclicality is also increasing in firm size for all firms at an increasing rate. With respect to the size of a downward adjustment we also find clear countercyclicality for all firms, which is more pronounced for larger firms. The results for these variables are as expected strongly asymmetric for upward and downward adjustments. However, the coefficients are quite similar in absolute magnitude.

Furthermore, the control variables included in this regression suggest that firms that have not adjusted for a longer time period have a smaller adjustment size. Finally, firms that move more frequently also tend to have a larger adjustment size. Except for firm age the results are symmetric and of similar magnitude suggesting that the average expansion and decline of firms is governed by quite similar determinants. Older firms have - ceteris paribus - a larger downward adjustment size and smaller upward adjustment size. Overall these results confirm our earlier findings. The cyclical sensitivity of adjustment hazards and adjustment size are increasing in firm size.

7 Conclusions

In this paper we traced the evolution of cross-sectional job creation rates for a large quarterly firm-level data set over the years 1975 to 2004 in Austria and studied the link between firm level employment growth and aggregate employment dynamics over the business cycle. We established a set of stylized facts concerning the cross sectional job creation rate distribution in this period.

In line with previous studies we find that the shape and location of this distribution is remarkably stable over time. Nevertheless, we are able to show that it is also characterized by important long-run trends and meaningful cyclical variation: The dispersion of job creation rates and the share of entry and exit as well as the share of adjusting firms increased over time while the kurtosis and the share of non-adjusting firms are characterized by a downward trend. This is in line with findings for other countries that have documented an increase in microeconomic volatility in the last decades (e.g. Comin and Philippon 2006; Comin and Mulani 2006), but adds to existing results with respect to entry, exit and non-adjustment and the other higher order moments of the job creation rate distribution.

With regard to the cyclical behavior of the job creation rate distribution the share of firms increasing employment is more strongly related to the business cycle than the share of firms reducing employment, so that the share of firms adjusting employment is higher in times of rapid aggregate employment growth. Firm entry is weakly procyclical, while firm exit is largely unrelated to the business cycle. In addition the higher order moments of the job creation distribution follow distinct cyclical patterns. The skewness and kurtosis of this distribution is procyclical while the standard deviation is countercyclical, sugesting increased heterogeneity in firm level job creation behaviour in upturns, and stronger effects of the business cycle on firms in the medium ranges of the job creation rate distribution.

Analysing variations in the response to aggregate employment changes of firms of different sizes and growth performance, our descriptive as well as our econometric results clearly confirm that firm size is of great importance in explaining these stylized facts: We find that large firms adjust employment more frequently, which points to size dependent adjustment costs, and that the upward trend in the share of firms adjusting employment is primarily due to changes in the adjustment hazard of small firms. Furthermore, small firms and firms with different positions in the job creation rate distribution differ in their reaction to aggregate employment chages. In particular the smallest firms and firms at the extremes of the growth rate distribution are largely unaffected by aggregate employment fluctuations.

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Notes

[1]Note that easy identification of the aggregate shock requires orthogonality of shocks and a measure of the aggregate shock. This orthogonality, however, would contradict theoretical models which propose mechanisms generating macroeconomic shocks from purely microeconomic causes (Jovanovic, 1987; Bak et al., 1993; Nirei, 2006; Gabaix, 2008, e.g.). Thus we refrain from explicitly identifying different types of shock

[2]See Winter-Ebmer (2003); Böheim (2006) and Kaniovski and Peneder (2008) for papers using this data and Hofer and Winter-Ebmer (2003) for a data description.

[3]We omit public sector employment and private households (i.e. firms with NACE two digits code of 75 or higher) since our primary aim is to study the behavior of private sector firms and because we lack data on tenured public employees.

[4]Note that log differences used in the industrial organization literature are also symmetric, but do not allow to account for entries and exits.

[5]In addition as also indicated by Figure 1 the growth rate distribution is extremely steep. In this respect Coad and Hölzl (2009) find that a clear tent-shaped pattern on a log-log scale that has even fatter tails than a Laplace distribution.

[6]Interestingly, comparing our results to those obtained by Higson et al. (2002) Higson et al. (2004) and Döpke et al. (2005), who use sales growth of a small sample of larger firms for the US, the UK and Germany, we find the greatest similarity when considering the firm size weighted job creation rate distribution. Here results concerning the mean, standard deviation and the kurtosis (for the weighted distribution) accord with these studies. In contrast to these studies, however, our evidence points toward an procyclical skewness.

[7]In addition the higher dispersion of the cyclical component of the first two moments for the unweighted job creation distribution and the larger dispersion for the skewness and the kurtosis of the weighted job creation distribution, reinforce the view of substantial differences between small and large firms.

[8]Again the the Baxter-King-filter was used to filter the series.

[9]The use of partial correlations where we control for one lag and lead of the growth rates of the percentiles yields a more symmetric pattern for the quarterly data which is then quite similar to the annual patterns reported in figure 5.

[10]Entries and exits have to be excluded because a number of dependent variables which are important for explaining firm growth (such as age and the frequency of moves) are not defined for entries

[11]The quadratic expression implied by the results in table 6 has a root at firm size of 1.6 employees.

[12]This is measured as the number of adjustments made by the firm relative to the number of periods for which this firm existed.

References

Bak, P, K Chen, J Scheinkman, and M Woodford, "Aggregate Fluctuations from Independent Sectoral Shocks: Self-OrganizedCriticality in a Model of Production and Inventory Dynamics," *Richerche Economiche*, 1993, *47* (1), 3–30.

Baxter, M. and R.G. King, "Measuring Business Cycles: Approximate Bandpass Filters for Economic Time Series," *Review of Economics and Statistics*, 1999, *81*, 575–593.

Böheim, R., "'I'll Be Back'–Austrian Recalls," *Empirica*, 2006, *33* (1), 1–18.

Bottazzi, G. and A. Secchi, "Explaining the Distribution of Firms Growth Rates," *Rand Journal of Economics*, 2006, *37*, 234–263.

Caballero, R. J. and E. M. Engel, "Microeconomic Adjustment Hazards and Arggregate Dynamics," *Quarterly Journal of Economics*, 1993, *108*, 359–383.

_ , _ , and J. Haltiwanger, "Aggregate Employment Dynamics: Building from Microeconomic Evidence," *American Economic Review*, 1997, *87*, 115–137.

Coad, A. and W. Hölzl, "On the Autocorrelation of Growth Rates: Evidence for Micro, Small and Large Firms from the Austrian Service Industries, 1975-2004," *Journal of Industry Competition and Trade*, 2009, *9* (2), 139–166.

Comin, D. and S. Mulani, "Diverging Trends in Aggregate and Firm Volatility," *Review of Economics and Statistics*, 2006, *88* (2), 374–383.

Comin, D and T. Philippon, "The Rise in Firm level Volatility: Causes and Consequences," in Mark Gertler and Kenneth Rogoff, eds., *NBER Macroeconomic Annual 2005*, MIT Press, 2006, pp. 167–2002.

Cooper, R., J. Haltiwanger, and L. Power, "Machine Replacement and the business Cycle: Lumps and Bumps," *American Economic Review*, 1999, *89*, 921–946.

Davis, S. J., J. Haltiwanger, R. Jarmin, and J. Miranda, "Volatility and Dispersion in Business Growth Rates: Publicly Traded versus Privately Held Firms," in D. Acemoglu, K. Rogoff, and M. Woodford, eds., *NBER Macroeconomics Annual 2006*, MIT Press, 2007, pp. 107–.

Davis, S.J. and J. Haltiwanger, "Gross Job Flows," in O. Ashenfelter and D. Card, eds., *Handbook of Labour Economics*, Vol. Volume 3A, Elsevier, 1999, pp. 2711–2805.

_ , _ , and S. Schuh, *Job Creation and Destruction*, Cambridge and London: MIT Press, 1996.

Döpke, J, M. Funke, S. Holly, and S. Weber, "The cross-sectional dynamics of German Business Cycles," Deutsche Bundesbank Discussion Paper Series 1: Economic Studies No. 23 2005.

Dosi, G., "Statistical Regularities in the Evolution of Industries: A Guide throughsome Evidence and Challenges for the Theory," in F Malerba and S Brusoni, eds., *Perspectives on Innovation*, Cambridge University Press, Cambridge, UK, 2007.

Foote, C., "Comment on Davis, Haltiwanger, Jarmin and Miranda," *NBER Macroeconomics Annual 2006*, 2007, pp. 157–166.

Gabaix, X., "The Granular Origins of Aggregate Fluctuations," Working Paper available at http://ssrn.com/abstract=1111765 2008.

Hammermesh, D. S., "Labor Demand and the Structure of Adjustment Costs," *American Economic Review*, 1989, *79*, 674–89.

— , *Labour Demand*, Princeton University Press, 1993.

Higson, C., S. Holly, and P. Kattuman, "The cross-sectional dynamics of the US business cycle: 1950-1999," *Journal of Economic Dynamics and Control*, 2002, *26* (9-10), 1539–1555.

— , — , — , and S. Platis, "The Business Cycle, Macroeconomic Shocks and the Cross-Section: The Growthof UK Quoted Companies," *Economica*, 2004, *71* (282), 299–318.

Hofer, H and R. Winter-Ebmer, "Longitudinal Data from Social Security Records in Austria," *Schmollers Jahrbuch*, 2003, *123*, 587–591.

Huber, P. and M. Pfaffermayer, "The Anatomy of the Firm Size Distribution: The Evolution of its Variance and Skewness," WIFO Working Paper 295 2007.

Jovanovic, B., "Selection and the Evolution of Industry," *Econometrica*, 1982, *50* (3), 649–670.

— , "Micro Shocks and Aggregate Risk," *Quarterly Journal of Economics*, 1987, *102*, 395–409.

Kaniovski, S. and M. Peneder, "Determinants of Firm Survival: A Duration Analysis Using the Generalized Gamma Distribution," *Empirica*, 2008, *35*, 41–58.

King, R.G. and J. K. Thomas, "Partial Adjustment without Apology," *International Economic Review*, 2006, *47*, 779–809.

Nilsen, O. A., K.G Salvanes, and F. Schiantarelli, "Employment Cahanges, the Structure of Adjustment Costs and Plant Size," *European Economic Review*, 2007, *51*, 577–598.

Nilsen, O.A. and F. Schiantarelli, "Zeros and Lumps in Investment: Empirical Evidence on Irreversibilities and Nonconvexities," *Review of Economics and Statistics*, 2003, *85*, 1021–1037.

Nirei, M., "Threshold Behavior and Aggregate Critical Fluctuations," *Journal of Economic Theory*, 2006, *127*, 309–322.

Stanley, M.H.R., S. Amaral, S.V. Buldyrev, S. Havlin, P. Leschhorn, P. Maas, M.A. Salinger, and H.E. Stanley, "Scaling Behavior in the Growth of Companies," *Nature*, 1996, *379*, 804–806.

Stiglbauer, A., "Job and Worker Flows in Austria 1978-1998." PhD dissertation, University of Linz 2003.

Sutton, J., "Gibrat's Legacy," *Journal of Economic Literature*, 1997, *XXXV*, 40–59.

Varejao, J. and P. Portugal, "Employment Dynamics and the Structure of Labor Adjustment Costs," *Journal of Labour Economics*, 2007, *25*, 137–165.

Winter-Ebmer, R., "Benefit Duration and Unemployment Entry: A Quasi-experiment in Austria," *European Economic Review*, April 2003, *47* (2), 259–73.

Table 1: Descriptive Statistics for job creation and destruction rates by year

	Share of Firms (in %)					Descriptive Statistics of the Job Creation Rate Distribution							
						Unweighted Distribution				Unweighted Excl. Entry and Exit			
Year	Entry	Exit	Growth	Decline	Inactive	Mean	Std. Dev	Skew-ness	Kurt-osis	Mean	Std Dev.	Skew-ness	Kurt-osis
1975	8.56	8.97	25.59	24.63	49.78	-0.003	0.88	-0.043	4.85	0.006	0.28	-0.24	9.85
1976	9.78	9.27	27.58	23.65	48.78	0.023	0.91	-0.022	4.55	0.016	0.28	-0.20	10.40
1977	9.00	8.52	27.76	22.54	49.70	0.023	0.87	-0.023	4.89	0.016	0.28	-0.20	10.26
1978	8.35	8.41	26.41	23.32	50.27	0.008	0.86	-0.041	5.07	0.012	0.28	-0.26	10.61
1979	8.75	8.81	26.49	24.11	49.40	0.005	0.88	-0.031	4.87	0.007	0.28	-0.35	10.66
1980	8.94	9.04	26.64	24.81	48.55	0.002	0.89	-0.026	4.76	0.005	0.28	-0.35	10.32
1981	8.70	9.20	26.31	25.32	48.38	-0.008	0.88	-0.040	4.77	0.003	0.28	-0.35	10.27
1982	8.44	9.36	25.07	26.45	48.49	-0.021	0.88	-0.047	4.80	-0.003	0.28	-0.40	10.24
1983	8.50	9.24	24.88	26.37	48.75	-0.018	0.88	-0.038	4.82	-0.004	0.28	-0.38	10.34
1984	8.58	9.21	25.83	25.67	48.50	-0.012	0.88	-0.040	4.82	0.001	0.28	-0.28	10.08
1985	8.74	9.27	25.78	26.00	48.23	-0.012	0.89	-0.028	4.76	-0.002	0.28	-0.26	9.90
1986	8.78	9.36	26.28	26.09	47.63	-0.012	0.89	-0.032	4.72	-0.001	0.28	-0.29	9.75
1987	8.91	9.31	26.36	26.08	47.56	-0.009	0.89	-0.024	4.69	-0.001	0.29	-0.30	9.74
1988	9.34	9.32	27.75	25.32	46.93	0.006	0.90	-0.023	4.59	0.007	0.29	-0.21	9.85
1989	9.82	9.42	28.14	25.88	45.99	0.011	0.92	0.001	4.45	0.004	0.29	-0.18	9.53
1990	9.89	9.43	29.58	25.23	45.19	0.019	0.92	-0.016	4.41	0.012	0.30	-0.16	9.19
1991	10.19	9.26	30.67	25.04	44.29	0.032	0.92	-0.009	4.37	0.017	0.31	-0.12	8.94
1992	9.85	9.55	29.17	26.49	44.34	0.013	0.92	-0.012	4.38	0.008	0.30	-0.13	9.05
1993	9.93	9.72	28.04	27.75	44.21	0.002	0.93	0.004	4.32	-0.002	0.31	-0.29	9.30
1994	10.11	10.10	28.22	27.79	43.99	0.000	0.94	-0.008	4.22	0.000	0.31	-0.28	9.50
1995	10.10	10.14	27.63	28.35	44.02	-0.006	0.94	0.006	4.22	-0.007	0.31	-0.31	9.52
1996	10.20	9.97	27.97	28.05	43.98	0.002	0.94	0.005	4.22	-0.003	0.31	-0.31	9.21
1997	10.65	10.63	28.13	28.50	43.37	-0.003	0.96	0.003	4.04	-0.004	0.31	-0.23	9.15
1998	11.60	11.20	29.52	28.06	42.42	0.010	0.99	-0.001	3.81	0.002	0.31	-0.19	9.14
1999	11.26	11.22	29.25	28.24	42.51	0.003	0.99	-0.010	3.85	0.003	0.31	-0.17	9.29
2000	11.20	11.22	29.48	28.40	42.12	0.002	0.99	-0.011	3.85	0.003	0.32	-0.15	8.91
2001	13.18	13.07	30.92	29.54	39.54	0.005	1.06	-0.011	3.37	0.004	0.32	-0.21	9.20
2002	10.71	11.36	28.67	28.95	42.38	-0.013	0.98	-0.020	3.89	0.000	0.32	-0.17	9.00
2003	10.71	11.18	28.39	28.80	42.82	-0.011	0.98	-0.012	3.94	-0.002	0.31	-0.22	9.17
2004	10.97	11.34	29.10	28.03	42.87	-0.004	0.98	-0.022	3.88	0.004	0.31	-0.18	9.66

Notes: Table displays values for the second quarter of each year respectively. Entry = firms with zero employment at the beginning of the period. Exit = firms with zero employment at the end of the period.

Table 2: Descriptive Statistics of different Job Creation Rate Distributions: Quarterly data

		unweighted distribution		firm size weighted distribution	
	Obs.	Mean	Std. Dev.	Mean	Std. Dev.
		(a) including entry and exit			
Mean	120	-0,0009	0,0629	0,0425	0,0267
Std. Dev.	120	0,6654	0,0629	0,2838	0,0520
Skewness	120	-0,0047	0,3745	4,4425	0,7362
Kurtosis	120	8,2541	1,6000	34,8042	12,0003
		(b) excluding entry and exit			
Mean	120	-0,0001	0,0229	0,0193	0,0239
Std. Dev.	120	0,2519	0,0286	0,1916	0,0367
Skewness	120	-0,1763	0,8059	2,3214	1,1367
Kurtosis	120	15,1375	1,4517	31,5373	7,7280

Notes: Figure reports the mean and standard deviation across years .

Table 3: Results of trend regressions for quarterly and annual data

	Quarterly Data			Annual Data		
	Coefficient		Std.Err.	Coefficient		Std.Err.
Share Entry	0.0160	***	0.0004	0.1097	***	0.0135
Share Exit	0.0160	***	0.0003	0.1055	***	0.0113
Share Growing	0.0130	***	0.0013	0.1293	***	0.0242
Share Declining	0.0160	***	0.0013	0.1899	***	0.0170
Share inactive	-0.0610	***	0.0018	-0.3192	***	0.0187
Growth rate distribution unweighted						
Mean	0.0000		0.0002	-0.0001		0.0003
Std. Dev	0.0010	***	0.0001	0.0049	***	0.0005
Skewness	0.0001		0.0001	0.0012	***	0.0002
Kurtosis	-0.0050	***	0.0001	-0.0444	***	0.0036
Growth rate distribution (firm size weighted)						
Mean	0.0000		0.0002	0.0016	***	0.0005
Std. Dev	0.0011	***	0.0001	0.0031	***	0.0008
Skewness	-0.0003		0.0010	-0.0239	***	0.0052
Kurtosis	-0.0262	***	0.0036	-0.2454	***	0.0501
Growth rate distribution (unweighted excluding entry and exit)						
Mean	0.0000		0.0001	-0.0003	**	0.0001
Std. Dev	0.0005	***	0.0001	0.0017	***	0.0001
Skewness	-0.0002		0.0028	0.0038	***	0.0015
Kurtosis	-0.0286	***	0.0021	-0.0509	***	0.0064

Notes: Table reports the coefficient β of a regression $y_t = \alpha + \beta t + \eta_t$ with y_t the value of the respective indicator at time t, and t a trend term. Std. Err. is standard error of the estimate. Entry = firms with zero employment at the beginning of the period. Exit = firms with zero employment at the end of the period. *** (**) (*) report significance at the 1% (10%) (5%) level, respectively

Table 4: Correlation results of cyclical component with the cyclical component of aggregate employment growth

	Quarterly Data										Annual Data	
	Std. Dev	Lead and Lags in Quarters									Std.Dev	Lag
		-4	-3	-2	-1	0	1	2	3	4		0
Share Entry	0.058	-0.05	-0.05	-0.04	0.05	0.20	0.26	0.32	0.36	0.33	0.3661	0.17
Share Exit	0.039	0.12	0.02	-0.08	-0.13	-0.13	-0.13	-0.11	-0.07	-0.04	0.2995	0.00
Share Growing	0.205	-0.05	0.10	0.33	0.54	0.66	0.64	0.52	0.32	0.12	0.5196	0.58
Share Declining	0.190	0.48	0.32	0.08	-0.20	-0.42	-0.51	-0.50	-0.41	-0.31	0.3641	-0.58
Share Inactive	0.165	-0.11	-0.15	-0.21	-0.28	-0.24	-0.17	-0.10	-0.02	0.09	0.4969	-0.18
Growth rate Distribution												
Unweighted												
Mean	0.003	0.04	0.02	-0.25	-0.09	0.35	0.32	0.01	0.07	0.32	0.0048	0.54
Standard Deviation	0.006	-0.01	0.07	0.00	-0.16	-0.09	0.06	0.04	-0.08	-0.01	0.0129	0.11
Skewness	0.057	0.04	0.02	-0.13	-0.17	-0.07	-0.05	-0.09	-0.05	0.02	0.0054	-0.06
Kurtosis	0.096	0.04	-0.05	0.04	0.25	0.14	-0.13	-0.13	0.09	0.06	0.0927	-0.15
Firm size weighted												
Mean	0.002	-0.02	0.04	0.00	0.20	0.52	0.52	0.28	0.25	0.36	0.0160	0.18
Standard Deviation	0.006	-0.13	-0.13	-0.29	-0.42	-0.28	-0.04	-0.01	-0.03	0.13	0.0284	-0.12
Skewness	0.106	0.16	0.16	0.33	0.42	0.18	-0.07	-0.05	0.01	-0.14	0.1698	0.10
Kurtosis	1.249	0.22	0.26	0.36	0.46	0.34	0.10	0.02	0.04	-0.05	1.5628	0.08
Unweighted excluding Entry and Exit												
Mean	0.001	-0.05	-0.08	-0.14	0.25	0.70	0.56	0.22	0.28	0.44	0.0027	0.60
Standard Deviation	0.002	0.04	-0.03	-0.26	-0.50	-0.43	-0.19	-0.13	-0.17	-0.03	0.0014	0.02
Skewness	0.036	0.06	0.15	-0.06	0.11	0.62	0.66	0.25	0.16	0.37	0.0321	0.83
Kurtosis	0.172	-0.25	-0.10	0.06	0.12	0.07	0.00	-0.03	-0.04	-0.05	0.1270	-0.35
aggregate employment	0.002	0.14	0.21	0.31	0.71	1.00	0.71	0.31	0.21	0.14	0.004	1.00

Notes: The table reports correlation for detrended and deseasonalized series (using the Baxter-King filter) with the cyclical component of aggregate employment growth. Entry = firms with zero employment at the beginning of the period. Exit = firms with zero employment at the end of the period. Correlation coefficients are significant at the 5% level for a coefficient value of 0.2 for quarterly data and 0.4 for annual data.

Table 5: Trend in Adjustment Probability by Firm size

	Inactive		Exit		Entry		Growing		Declining	
	Coeff	Std.Err	Coeff	Std.Err.	Coeff	Std.Err.	Coeff	Std.Err.	Coeff	Std.Err.
0 to 4	-0.075	(0.003)**	0.024	(0.001)**	0.025	(0.001)**	0.01	(0.001)**	0.015	(0.002)**
5 to 9	-0.011	(0.002)**	0.003	(0.000)**	0.002	(0.000)**	-0.003	-0.002	0.008	(0.002)**
10 to 14	0.015	(0.002)**	0.002	(0.000)**	0.001	(0.000)*	-0.009	(0.003)**	-0.009	(0.002)**
15 to 20	0.017	(0.002)**	0.002	(0.000)**	0.001	(0.000)**	-0.007	(0.003)*	-0.013	(0.003)**
20 to 24	0.02	(0.002)**	0.002	(0.000)**	0.001	(0.000)**	-0.008	(0.004)	-0.015	(0.003)**
25 to 29	0.013	(0.003)**	0.001	(0.000)**	0.001	(0.000)*	-0.003	(0.005)	-0.013	(0.004)**
30 to 34	0.02	(0.003)**	0.001	(0.000)**	0.001	(0.000)**	-0.008	(0.006)	-0.015	(0.005)**
35 to 39	0.021	(0.003)**	0.002	(0.000)**	0.001	(0.000)*	-0.004	(0.006)	-0.021	(0.006)**
40 to 44	0.016	(0.004)**	0.001	(0.000)**	0.002	(0.000)**	-0.002	(0.007)	-0.017	(0.006)**
45 to 49	0.012	(0.003)**	0.001	(0.000)**	0.002	(0.000)**	0.001	(0.007)	-0.016	(0.007)*
50 to 59	0.016	(0.003)**	0.001	(0.000)**	0.001	(0.000)**	0.003	(0.006)	-0.021	(0.006)**
60 to69	0.018	(0.003)**	0.001	(0.000)**	0.001	(0.000)*	-0.002	(0.007)	-0.018	(0.007)*
70 to 79	0.019	(0.003)**	0.001	(0.000)**	0.002	(0.000)**	-0.007	(0.008)	-0.016	(0.008)
80 to 89	0.01	(0.004)*	0.001	(0.000)**	0.002	(0.001)**	-0.002	(0.008)	-0.011	(0.008)
90 to 99	0.017	(0.004)**	0.001	(0.000)**	0.003	(0.001)**	0.005	(0.010)	-0.025	(0.009)**
100 to 119	0.017	(0.003)**	0.00	(0.000)	0.002	(0.000)**	0.003	(0.009)	-0.022	(0.009)*
120 to 139	0.013	(0.004)**	0.000	(0.000)	0.002	(0.000)**	0.003	(0.010)	-0.018	(0.011)
140 to 159	0.003	(0.004)	0.001	(0.000)	0.002	(0.001)**	0.009	(0.010)	-0.015	(0.010)
160 to 179	0.006	(0.004)	0.000	(0.000)	0.003	(0.001)**	0.007	(0.013)	-0.016	(0.012)
180 to 199	0.013	(0.004)**	0.000	(0.000)	0.002	(0.001)**	-0.009	(0.013)	-0.006	(0.013)
200 to 249	0.003	(0.003)	0.000	(0.000)*	0.002	(0.001)**	0.025	(0.012)*	-0.031	(0.011)**
250 to 299	-0.004	(0.004)	0.000	(0.000)	0.003	(0.001)**	0.03	(0.012)*	-0.029	(0.012)*
300 to 349	0.009	(0.004)*	0.000	(0.000)	0.001	(0.001)	0.039	(0.015)*	-0.051	(0.015)**
350 to 359	-0.002	(0.005)	0.000	(0.000)	0.001	(0.001)	0.048	(0.015)**	-0.046	(0.016)**
400 to 449	-0.005	(0.006)	-0.001	(0.000)	0.001	(0.001)	0.059	(0.016)**	-0.055	(0.016)**
450 to 499	-0.006	(0.005)	0.000	(0.000)	0.002	(0.001)*	0.017	(0.019)	-0.013	(0.019)
500+	-0.004	(0.002)	0.000	(0.000)	0.001	(0.001)	0.026	(0.014)	-0.023	(0.014)

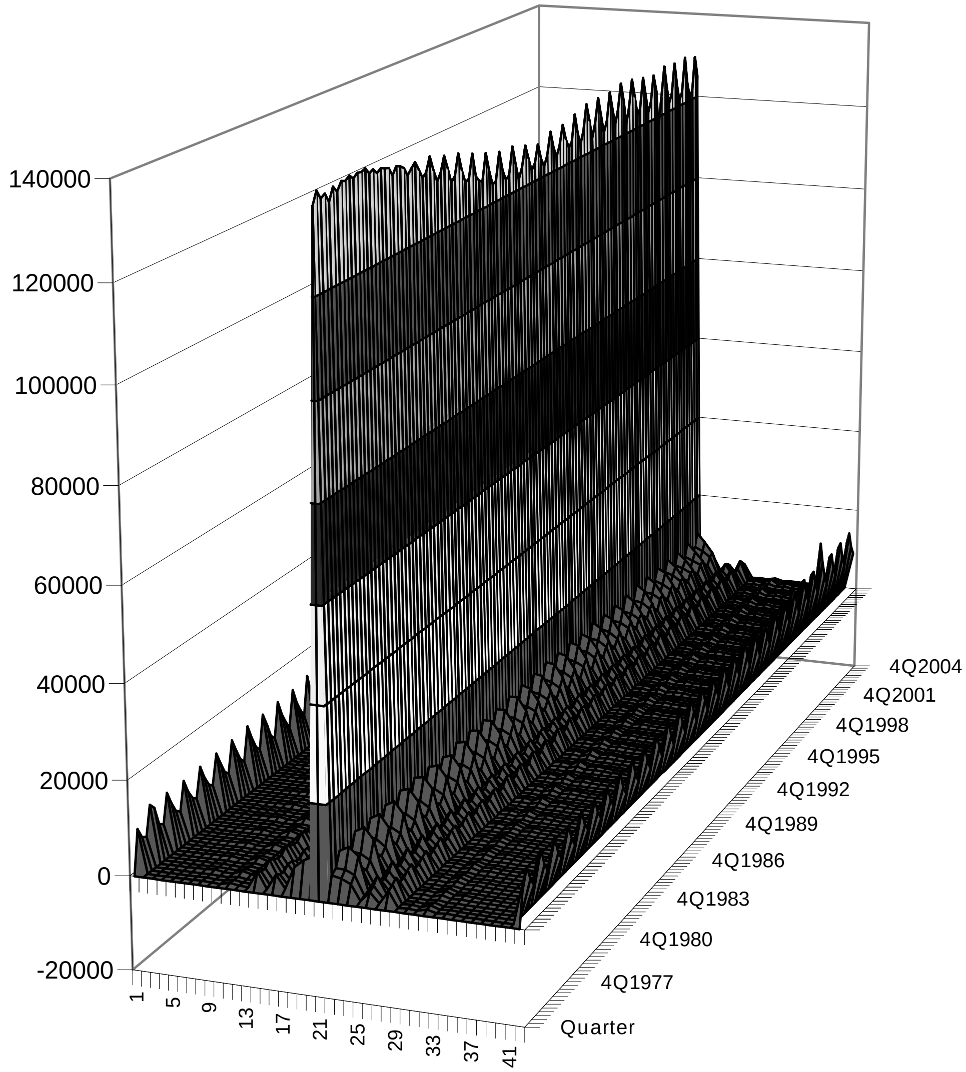
Notes: The table reports the coefficient β of a regression $y_t = \alpha + \beta t + \eta_t$ with y_t the value of the respective indicator at time t, and t a trend term. Coeff= coefficient Std.Err. = standard error of the estimate. Entry = firms with zero employment at the beginning of the period. Exit = firms with zero employment at the end of the period.*** (**) (*) report significance at the 1% (10%) (5%) level, respectively.

Table 6: Regression Results for Multinomial Logit Model

	Adjustment Probability	Adjustment Size Growth	Decline
ln(aggregate employment growth)	-2.0202***	1.6501 ***	-1.5678 ***
	(0.0637)	(0.0973)	(0.0981)
ln(aggregate employment growth)	4.4093 ***	-0.3962 **	0.3776 ***
*ln(firm size)	(0.0268)	(0.0908)	(0.0952)
ln (aggregate employment growth)	0.0159 ***	0.4237 ***	-0.3878***
*ln(firm size)^2	(0.0062)	(0.0076)	(0.0076)
100*age	-0.2954***	-0.0447***	0.0183***
	(0.0029)	(0.0023)	(0.0023)
1000*age squared	0.0182 ***		
	(0.0003)		
Ln(firmsize)	0.0191 ***	-0.9030 ***	-0.9370 ***
	(0.0005)	(0.0010)	(0.0010)
ln(firmsize)^2	-0.0052 ***	0.0187 ***	0.0212 ***
	(0.0001)	(0.0002)	(0.0002)
Duration of non-adjustment		-0.0007 ***	-0.0049 ***
		(0.0001)	(0.0001)
Frequencey of moves		1.6555 ***	1.6959***
		(0.0220)	(0.0216)
Frequency of moves squared		-4.9264 ***	-5.1332 ***
		(0.0417)	(0.0414)
Frequency of moves cubed		4.5495 ***	4.7733 ***
		(0.0244)	(0.0244)
λ		0.2020 ***	0.2197 ***
		(0.0232)	(0.0241)

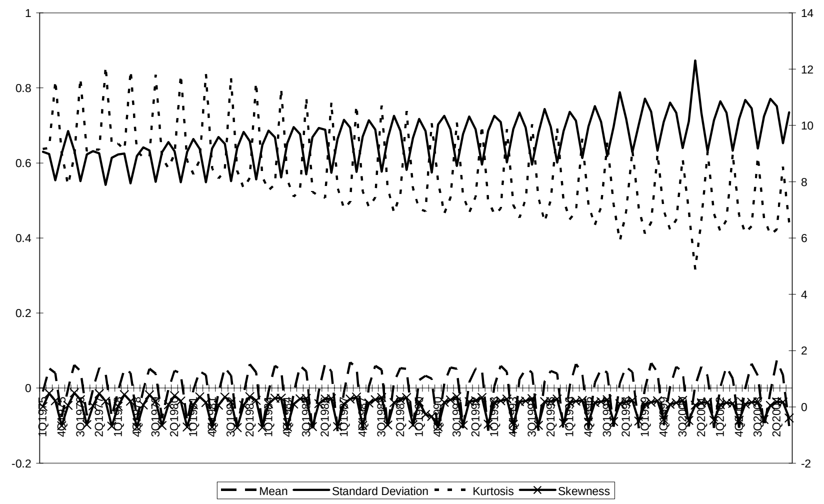
Notes: NACE 2 Digit dummies interacted with seasonal dummies omitted, values in brackets are standard error of the estimate. *** (**) (*) report significance at the 1% (10%) (5%) level, respectively

Figure 1: The frequency distribution of the quarterly Job Creation Rates

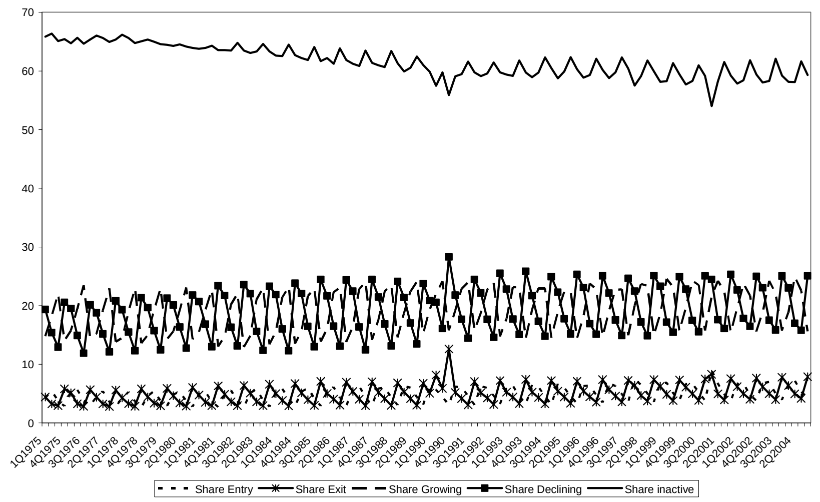


Notes: Figure displays job creation rates from the 1st Quarter 1975 to the 4th Quarter 2004.

Figure 2: Share of Firms by Adjustment Type and higher order Moments of the Growth Rate Distribution



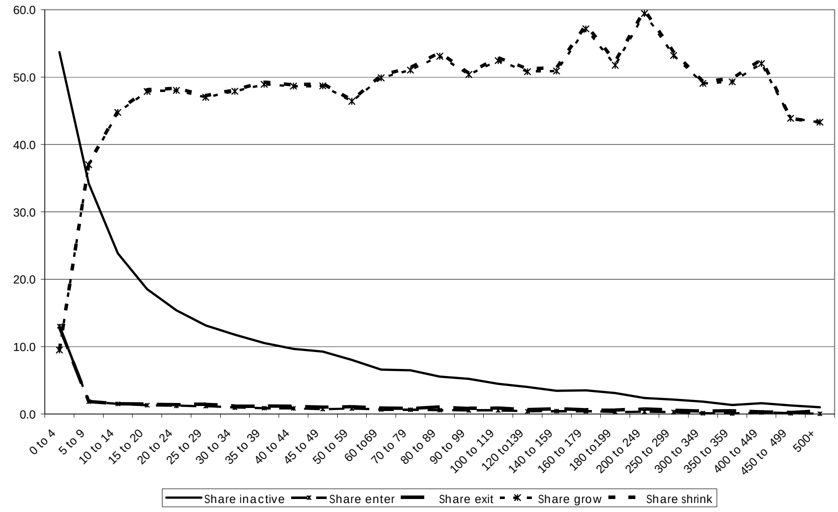
a) Moments of the Job Creation Rate Distribution



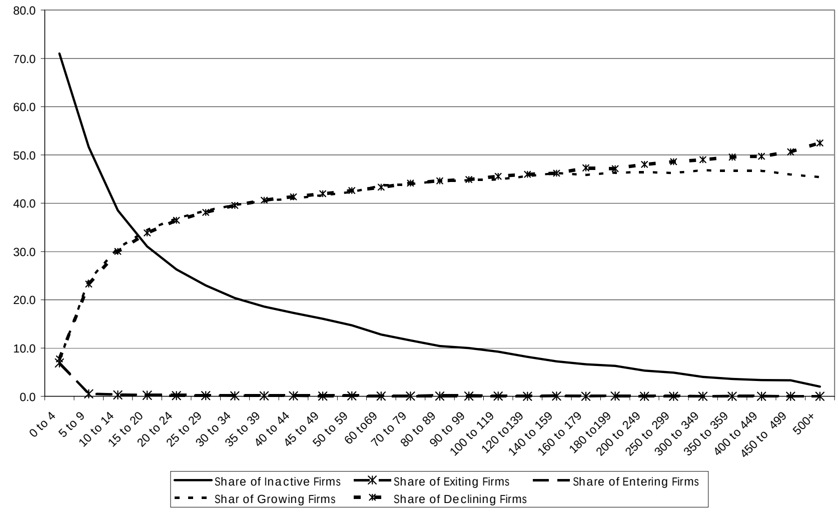
b) Share of entering exiting and closing firms

Notes: Figure Reports averages over the time period from 1st quarter 1975 to 4th quarter 2004.

Figure 3: Share of Firms by Adjustment Type (Average over all Periods)



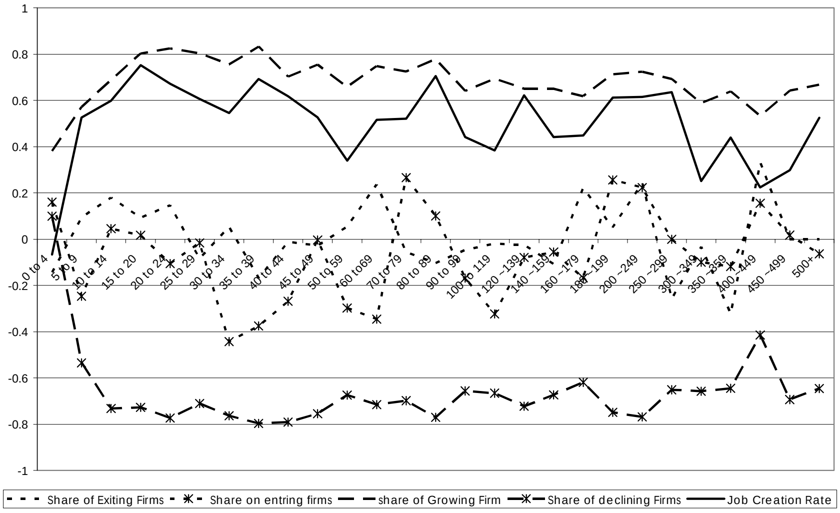
a) Annual Data



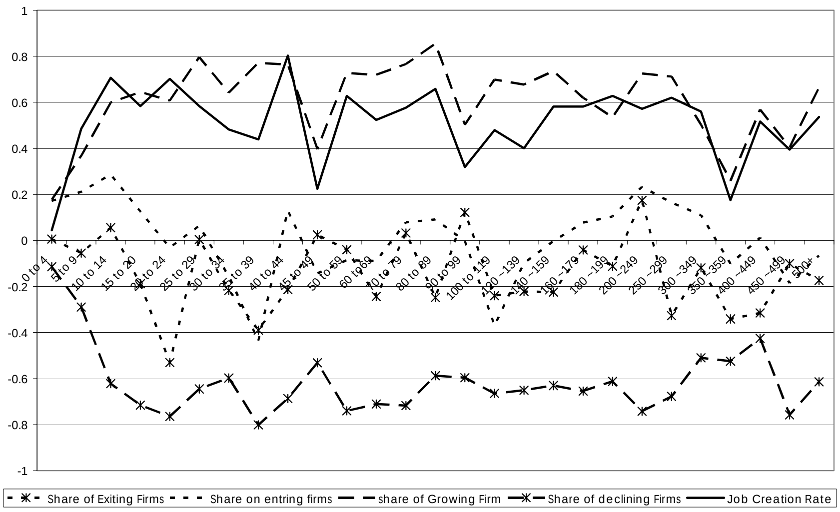
b) Quarterly Data

Notes: Figure Reports averages over the time period from 1st quarter 1975 to 4th quarter 2004.

Figure 4: Cyclical Response of Employment Adjustment by firm size



a) Quarterly Data



b) Annual Data

Notes: Figures show the correlation coefficient of the cyclical component of aggregate employment with the respective indicator for the each size group, correlation coefficients are significant at the 5% level for a coefficient value of 0.2 for quarterly data and 0.4 for annual data. Entering firms are firms with zero employment at the beginning of the period. Exiting firms are firms with zero employment at the end of the period.

Figure 5: Cyclical Response of Employment Adjustment by growth percentiles

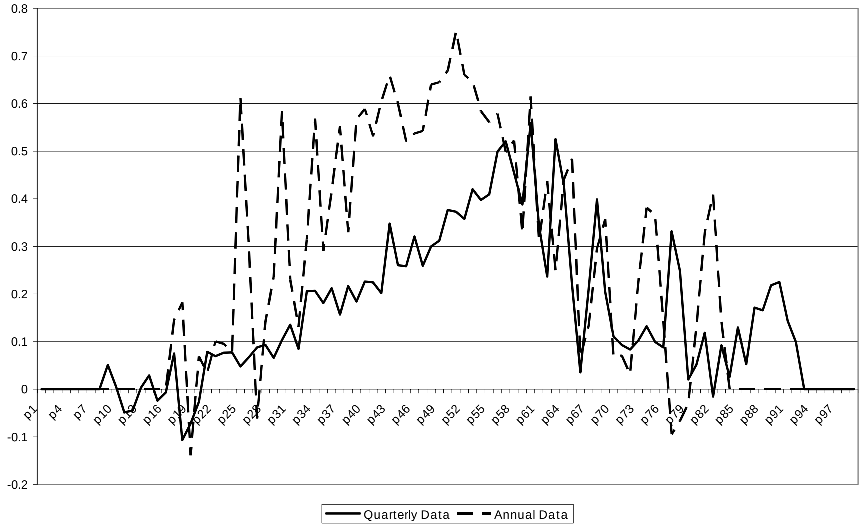


Figure shows the correlation coefficient of the cyclical component of aggregate employment with the respective indicator for each percentile of the growth distribution, correlation coefficients are significant at the 5% level for a coefficient value of 0.2 for quarterly data and 0.4 for annual data

Figure 6: Implied Coefficient on aggregate Employment growth in dependence of firm Size

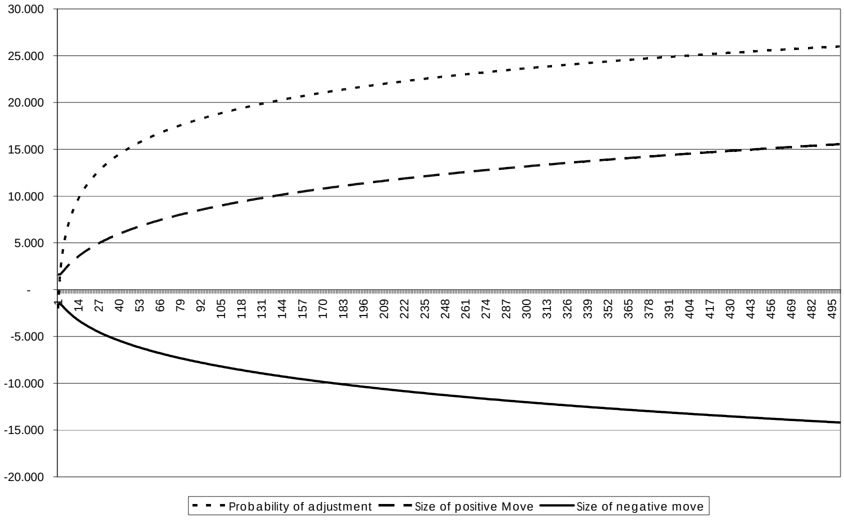


Figure shows the implied coefficient on aggregate employment growth in dependence of firm size derived from results in table 6

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