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ABSTRACT

When and How to Create a Job: The Survival of New Jobs in Austrian Firms*

While the volatility of job creations has been studied extensively, the survival chances of new jobs are less researched. The question when and how to expand a firm is of importance, both from the firms and from a macro perspective. Adjustment cost theories and arguments about option values of investment in firm expansion make predictions about the timing, sequencing and form of firm expansions. When we analyze 21 years of job creation in Austria, we find that the survival of new jobs (and of new firms) depends upon the state of the business cycle at the time of job creation, on the number of jobs created, and on firm age. Jobs in new firms last longer than new jobs in continuing firms.

JEL Classification: J23, J63, E24, E32

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1 Introduction

For an entrepreneur the expansion of productive capacity is costly and the returns are uncertain. At the time of expansion, the entrepreneur has to decide whether or not to employ additional workers, given economic circumstances. These circumstances are constantly changing and so may change the prospects of jobs. By looking at a large data set over a considerable time span we investigate the relationship between economic circumstances and the survival of newly created jobs in Austria.

We focus on the labor side of expansions of firms and analyze the persistence of job creations. The persistence of productive capacity gives evidence on the success of investment strategies, details the obsolescence of technical equipment and the time span needed to recover fixed costs. Unfortunately, the persistence of firm expansions is difficult to measure. If capacity expansions lead to job creations[1], the persistence of the job creation may be used as an indicator of the persistence of the overall capacity expansion. Of course, a given technology may require fewer workers over time, as soon as learning effects materialize. The persistence of job creations can thus be considered a lower bound of the persistence of productive capacity. Moreover, the persistence of jobs is important for public policy, which is generally interested in employment related outcomes of policy interventions, such as e.g. investment subsidies, regional subsidies, or research and development programs.

Labor and macroeconomists have been concentrating their attention on the analysis of (firm-specific) flows in the labor market in recent years (Davis, Haltiwanger and Schuh, 1996). U. S. studies revealed a large degree of job reallocation in all sectors, in all regions and in all periods - a result which was confirmed by European studies.

[1] Abel and Eberly (1998) show that when employment decisions depend on the capital stock, employment may exhibit the same discrete pattern as investment; the expansion of the workforce can therefore be used as a good proxy for investment. Empirical evidence for the US (Sakellaris, 2001) and for Italy (Narazani, 2004) confirms this view: there is a high correlation between spikes in employment creation and investment in individual firms. Letterie, Pfann and Polder (2004) are more skeptical if discrete jumps in the labor adjustment in the Netherlands can be explained by spikes in investment alone.

(See Davis and Haltiwanger, 1999, and Gómez-Salvador, Messina and Vallanti, 2004.) In contrast to this, the stability of job creations has received much less attention. What determines the success of a job creation? Dynamic labor demand theory and analogies from investment theory may help in forming hypotheses. Two issues are important, (i) the amount and the form of adjustment costs, and (ii) the option value of investment, which is subject to uncertainty and irreversibility.

Adjustment costs (Hamermesh, 1989) can either be independent of the size of the adjustment (lump-sum) or variable (typically convex, increasing with the size of the expansion). If adjustment costs are convex, then it would be best to adjust gradually to a new optimal level of the number of employees. In the case of lump-sum adjustment costs, since the same costs arise in any expansion irrespective of the size of the job creation, instantaneous adjustment to the new level is best. Whereas no direct test of the form of adjustment costs can be made here, the analysis allows to test whether or not small expansions are more successful than large expansions.

The option value theory of investment (Dixit and Pindyck, 1994) may also provide guidance on investment decisions. Here, the entrepreneur has an investment opportunity, which can be implemented today or tomorrow. If the entrepreneur postpones investment until tomorrow, he or she may learn more about uncertain characteristics of the market but forgoes profits from the current period. This trade-off constitutes the option value of investment. In such a framework, dividing the investment project into several sub-projects increases flexibility and thus offsets, to some degree, the disadvantages smaller projects have because of (dis-)economies of scale.

From a business perspective, entrepreneurs would like to know how they should design expansions. From a macroeconomic perspective, the timing and persistence of expansions over the business cycle is of great importance. Intuition suggests that a job creation might be more permanent if started in an expansion, because the firm can profit from better demand conditions at this time. However, low interest rates in a boom will make also investment projects of a more risky type viable, which may result in less persistence. Market entry will increase competition for continuing firms, which may also lead to shorter job durations. Which effects dominate the survival chances of a job creation remains an empirical issue.

The reallocation of labor across production units over the business cycle has important implications for our understanding of aggregate macroeconomic shocks (Caballero and Hammor, 1994, 1996). Previous research has concentrated on the association of the business cycle with the magnitude of job creation, job destruction and job reallocation. Whereas job creation is strongly pro-cyclical and job destruction is countercyclical, the cyclical properties of total job reallocation (the sum of job creation and destruction) are less clear-cut. U. S. studies typically find a concentration of job reallocation in recessions (Davis et al., 1996), but the results for European countries are mixed (Boeri, 1996, Gómez-Salvador et al., 2004).

Not only the magnitude of reallocation is important, but also how *permanent* the reallocation of production factors is. It is perfectly possible that firms lay off workers during downturns and re-hire them in upturns. In that case, reallocation would not be considered permanent. However, it is empirically difficult to separate temporary cyclical employment adjustments from permanently relocated labor. To that end, researchers have tried to identify permanent employment changes (long-term reallocation) by creating indicators of job persistence. Job persistence indicators measure the permanence of labor reallocation at the establishment level in contrast to aggregate indicators of job creation or job destruction.

There is only limited evidence on the relationship of job persistence and the business cycle. Davis et al. (1996) present evidence that job persistence is greater in expansions than in recessions. Figura (2002) uses a time-series filter approach to separate between temporary and permanent employment changes and finds that permanent job creation is predominantly concentrated in expansions (whereas permanent job destruction is concentrated in recessions).

Establishment turnover and new establishments are important determinants of the persistence of new jobs (Jovanovic, 1982). Establishment births account for a large fraction of newly created jobs. From a policy perspective, it is important whether job creation is more permanent in newly founded firms or in continuing firms.

To study the survival chances of newly created jobs, we translate the persistence measure proposed by Davis et al. (1996) into survival time by considering the following

time spans: (1) Time until the *first* job of the original job creation is lost, (2) time until a *typical* new job is lost, and (3) time until the *total* job creation is lost. We study the survival of newly created jobs from 1978 to 1998 and focus on firm characteristics and on the relationship with business cycle indicators at the time of the job creation.

Our results indicate that a typical newly created job survives longer, the larger the job creation was. This result seems to support to the adjustment cost theory with fixed adjustment costs. Jobs created by new establishments have greater job persistence than new jobs with continuing firms. Finally, a new job is of considerably longer duration if the job was created when unemployment was high.

2 Data and job turnover

We use employment records from the Austrian social security system ("Hauptverband der Österreichischen Sozialversicherungsträger"). The data cover all employees in the Austrian private sector and all non-tenured public sector workers. Establishments are identified by the employers' social security number. Due to classification changes for administrative purposes, there is potential measurement error, a problem prevalent in most administrative data. We take particular care to avoid such classification errors (see below). The data cover the period of January 1978 to December 1998.[2]

We observe quarterly employment at the following sampling dates, 10 February, 10 May, 10 August, and 10 November. We define a job creation if the number of employed persons in an establishment in any quarter *t* is greater than in the preceding quarter *t-1*. Of all job creations in the data, we draw a 10 per cent random sample, stratified by quarter, sector, and the age of the establishment.[3] The sample consists of

[2] For a more extensive discussion of features of the data and data processing see Hofer and Winter-Ebmer (2003) and Stiglbauer et al. (2003).

[3] The age of establishments is calculated from its first observation or, if established before 1972, censored at January 1972. We focus on the private sector and drop all sectors which have a substantial share of tenured civil servants, because a change in employment in these sectors might be due to a change

some 197,000 job creation episodes, which created on average 2.14 jobs per quarter. Of these establishments, 153,019, or about 78 per cent, existed in the previous period, 24,934 (13%) were new establishments and 18,986 (10%) re-entered. Data cleaning and missing variables – in particular past employment rates – leaves us with an estimating sample of approximately 144,000 continuing, 24,000 new and 18,000 re-entering establishments.

2.1 Classification of establishment entries

There could be “spurious" entries and exits of employers resulting from administrative changes in the establishment identifier, which would add “artificial" labor flows. (For instance, establishments can be given a new identifier when they change addresses.) To overcome this problem, we use a classification method which was recently applied to comparable Swedish data (Persson, 2004). Using the employees’ social security number, this procedure checks whether a “substantial” part (two thirds) of the workers of a new establishment can be found in another establishment in the previous period. By the relative magnitude of the overlap of workers’ identities, we distinguish new establishments (“births”) from administrative changes of identifiers. If an establishment is recorded as entering, but it appears to be merely a change of the identifier, then we treated it as a continuing establishment. For the real entries identified by this procedure, we make a further distinction between births and re-entries. Re-entering establishments did not employ a worker for at least one period and have at least one worker on their payroll in the sample period. These could be small businesses in the professions or crafts, where the owner is the main worker, employing other workers only some of the time.

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in the legal status of employees. We exclude the following sectors from the analysis: public sector (public administration, social security administration, military), health services, and transport. We also drop establishments in agriculture and forestry, construction, hotels and restaurants because these sectors exhibit strong seasonal variation. Consequently, our estimating sample covers 9 sectors.

2.2 Job creation and destruction in Austria

Rather restrictive firing restrictions and strong unions at the industry and firm level characterize Austria's labor market institutions. Such institutions should be of central importance for explaining the allocation and reallocation of labor. Austria is a relatively highly regulated country with respect to job security provision (Emerson, 1988). Accordingly, taking differences in the size distribution and the sectoral composition of firms into account, Austrian job flow rates are substantially lower than in the U. S. (Stiglbauer et al., 2003) and other European countries (Gómez-Salavador et al., 2004). Total job reallocation is not correlated with the business cycle.

2.3 Sample Summary Statistics

Table 1

Table 1 provides summary statistics of our data. The average job creation was small, with about 2.4 jobs per quarter in continuing and about 1.5 in new and in re-entering establishments. The average net job creation in continuing establishments was on average about 22 per cent of the previous quarter's number of workers. New establishments appear to start small, about three quarters of establishments started with just one employee. We see that many job creations seem to accommodate minor fluctuations in labor demand. Almost two thirds of continuing establishments created only one new job. A significant minority of continuing and re-entering establishments, 14% and 32%, created just one job and had with the new job the same number of workers on their payroll than two quarters before. (About 17% of all continuing and about 35% of re-entering establishments had the same number of workers after the job creation as they had two quarters before.) This could reflect a time lag between an unfilled vacancy at time t-1 and the hiring in the sampling quarter t, which may be caused by staff turnover rather than the firm's business strategy. If we erroneously interpret this as a job creation, the persistence of job creation will be biased upwards. In the regressions, we control for such a possibility using an indicator variable.

Some structural differences between new and old firms can be seen in the hiring process. In continuing establishments, the majority of new workers were up to 25 years of age (52%) whereas in new births as well as in re-entering firms only a quarter of workers were below 25 years of age. In continuing firms 44% of new workers were blue-collar workers, compared to new establishments with only one third. Some 45% of the new workers in continuing establishments were women, whereas more than half were female in new establishments and in re-entering establishments. The median daily wage for newcomers was 360 Austrian Schillings (ATS, in 1995 prices) in re-entering establishments; it was about 430 ATS in continuing establishments and about 456 ATS in entering establishments.[4] We also observe a structural change during the sampling period, about 40% of new establishments are active in the service sector whereas only 21% of the continuing establishments are in the service sector.

There might be more hires than implied by our measure of job creation because workers may be hired to replace other workers who may not have yet left the firm. To test the influence on the persistence of job creation, we calculate the churning rate (as defined by Burgess, Lane and Stevens, 2000) for each establishment *e* in the quarter of the job creation:

$$\text{Churning rate} = \frac{(H_{et} + S_{et} - \left| N_{et} - N_{e,t-1} \right|)100}{\left(N_{et} + N_{e,t-1}\right)/2}\ , \qquad (1)$$

where N is employment, H are hires, and S are separations between *t-1* and *t*.[5] The churning rate was on average 7%. Finally, our table contains information on the business cycle indicators (see below) and on the sectoral mix of establishments.

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[4] Daily wages, calculated from the yearly gross earnings divided by the number of employed days (without sick leave payments). There is no information on the number of hours worked.

[5] Hires and separations are measured by comparing workers' identities between the two consecutive sampling dates.

3 Empirical methods

3.1 Persistence of job reallocation

Davis et al. (1996) construct a persistence measure for newly created jobs: The *n*-period persistence of a job creation (denoted by p_{tn}) is the percentage of the new jobs at time *t* that remain filled at each sampling date until time *t*+*n*. For each establishment *e* that had a job creation in *t* (i. e. $N_{et} - N_{e,t-1} > 0$), the number δ_{etj} is an indicator whether employment N_{t+j} is greater in period *t*+*j* than after the job creation, less than before the job creation, or between these values:

$$\delta_{etj} = \begin{cases} N_{e,t} - N_{e,t-1} = C_{et} & \text{if } N_{e,t+j} \geq N_{et} \\ 0 & \text{if } N_{e,t+j} \leq N_{e,t-1} \\ N_{e,t+j} - N_{e,t-1} & \text{if } N_{e,t+j} \in \left(N_{e,t-1}, N_{et}\right) \end{cases} . \qquad (2)$$

Establishment-level persistence (i. e. the number of new jobs surviving) in absolute terms is computed as follows:

$$P_{et0} = C_{et} \ , \quad P_{etj} = \min[P_{e,t,j-1}, \delta_{etj}] \ , \quad j = 1,2,...,n \, . \qquad (3)$$

The *n*-period persistence rate at the establishment level is the number of jobs persisting after *n* quarters relative to the magnitude of the initial job creation:

$$p_{etn} = P_{etn} / C_{et} \, . \qquad (4)$$

Similarly, the aggregate persistence rate of job creation is given by:

$$p_{tn} = \frac{\sum_e P_{etn}}{C_t} \, . \qquad (5)$$

If we compare aggregate persistence rates as defined by (5) from our data to the results of Davis et al. (1996), we see that Austrian persistence rates are similar to their results. The one-quarter persistence rate is about 63% and the four-quarter persistence rate is 32%. The corresponding values from Davis et al. are 68% and 38%.

3.2 Survival regression framework for newly created jobs

Persistence rates do not lend themselves easily for empirical analysis. In fact, apart from cross-tabulations of various *n*-period persistence rates (e. g. Davis et al., 1996 and Armington and Acs, 2000), there is no detailed analysis of persistence in the job creation literature. We translate the persistence measure into survival time and consider several durations. The *survival of the first new job* is defined as the number of quarters until the number of jobs in an establishment – after the job creation – has decreased, i.e. establishment-level persistence given in (1) is lower than unity. Alternatively, the *survival time of a typical new job* calculates the mean duration of all the jobs created at a point in time in an establishment and it is given by:

$$\bar{p}_{et} = 1 + \sum_{j=1}^{n} p_{etj} \,. \tag{6}$$

Finally, we consider the time until the *total job creation is lost,* i. e. the duration until establishment-level persistence has dropped to zero. Note that if only a single job is created, then all these measures are identical.

Figure 1 displays Kaplan-Meier estimates of the survivor functions of the three survival times, separately for continuing, new and re-entering establishments. Panel (a) displays estimates of the survival of the first job. It confirms the intuition that most new jobs are short-term. We also see that new jobs in continuing establishments have a much lower survival chance than with new or re-entering establishments. Half of the average jobs survive until the eighth quarter if created by a new establishment, but merely until the third quarter if created in a continuing or re-entering establishment. The pattern is similar for average and total job creation, with still more similarity between continuing and re-entering establishments.

Our aim is to investigate the relationship between the creation of jobs and their chances of survival, given the economic circumstances at the time of creation. For this purpose it appears appropriate to use survival techniques which are widely adopted by industrial economists for the survival of new establishments (e. g. Audretsch and Mahmood, 1994, 1995, and Disney, Haskel, and Heden, 2003). To our knowledge, the survival of new jobs was not investigated in this way before. We use a Cox proportional

hazard model to estimate the hazard rates of new jobs. The Cox model specifies the hazard function $h(t)$ as:

$$h(t) = h(0)\exp(X'\beta). \quad (7)$$

The hazard rate $h(t)$ is the rate of a job at t, given that it existed up to $t-1$, with which it will cease to exist in the next period. The baseline function $h(0)$ specifies the hazard function when all covariates are set to zero, X is the vector of covariates and β is the vector of coefficients to be estimated. The Cox model does not require any assumptions regarding the baseline hazard, but belongs to the class of proportional hazard models, where the impact of all covariates is assumed to be proportional to the baseline hazard. It therefore allows a flexible estimation of the association of the covariates with the survival chances of the newly created jobs.

3.3 Business Cycle Indicators

Because we are using time dummy variables in our estimations, we need business cycle indicators which do vary both over time and across sectors. We employ four different indicators to gauge the relationship between the survival of an establishment's job creation and the cycle at the time of job creation. Our indicators are the average sectoral and regional unemployment rates over the last 12 months. We also estimated the regressions using regional and sectoral employment growth rates. The results are very similar if either indicator is used – with the opposite sign, of course. The business cycle indicators vary over time, between the 9 sectors, and between approximately 100 local districts. Our specification also includes dummy variables for the sectors and the districts as well as seasonal controls.

4 Results

In Tables 2 - 4 we present the Cox regressions of the three survival times. In each table, the first three columns display separate regressions for continuing, new and re-entering establishments. The fourth column contains results for the pooled sample of job creations with controls for new and re-entering establishments. The results are presented as hazard ratios. A hazard ratio greater (less) than 1 signifies a bigger

(smaller) hazard and the job is lost sooner (later). As most job creations are small in number the coefficients of most variables are similar regardless which duration variable is considered.

We see that job creation in new firms (and in re-entering firms) is more persistent than in continuing firms. The hazard rate for jobs created in new firms is approximately 45% lower than corresponding hazards for jobs in continuing firms. For re-entering firms, the effect is somewhat in-between. This corresponds with results from the literature. Cross-tabulations of persistence by age in Davis et al. (1996) and Armington and Acs (2000) indicate higher job creation persistence when jobs are created by new firms or plants.[6]

Table 2

Table 3

Table 4

Does a small (cautious) job creation result in longer lasting jobs than a large (bold) job creation? For continuing establishments, a large relative expansion is related to long-lasting jobs, but the quantitative effect is small. For new firms, the effect is mixed: A large expansion increases the chance that the first job is lost sooner than a similar job created in a small expansion, but the chance that the average job (or all jobs) survives longer is higher. In terms of adjustment costs, these results would favor the assumption of lumpy adjustment costs: larger job creations are more permanent than gradual ones. The opposite can be seen in re-entering firms: larger job creations are estimated to result in shorter durations of the average job. In general, the results indicate that larger expansions are more successful than smaller expansions (since more jobs are created by continuing and new establishments than by re-entering establishments).

[6] However, the differences these authors find are not as strong as they emerge from our results.

Structural characteristics of the job creation, for example, the demographic composition of the newly hired workers show a statistical association with the survival of the jobs. Jobs in new firms are estimated to be more persistent if they are filled by prime age, female, or white-collar workers. The hazard rate of a typical job in a new firm (Table 3) is 22% higher, if the job is filled by a worker younger than 25, in relation to a worker who is between 25 and 50 years of age. It is 7% higher, if the worker is over 50. If the job is filled with a blue-collar worker, the hazard is 22% higher than if it was filled with a white-collar worker. The hazard is 16% lower if the new employee was female, rather than male.

The effects are similar for continuing firms. The job creation history over the last two years does not show an association with the duration of the new jobs. A higher churning rate in the past, implying excess hires, reduces the duration of the new jobs, however, the estimated coefficient is relatively small. The wage structure of the employees has no big impact. There is some indication that if the median wage of the new workers is higher, the jobs last longer. A higher wage for new workers could reflect that their human capital is more valuable to the firm. Remember that we cannot directly control for education, but only for age and labor supply (via the unemployment rates).

We use the information if only one job was created and employment in *t* equals employment in *t-2*, to control for employment fluctuations which do not necessarily correspond to job creations. The estimated hazard rates indicate that the creation of a single job is short-lived. Returning to previous employment levels is also associated with jobs that do not last long. This association is as expected, because we interpret such fluctuations as (small) deviations from the optimal employment level of the establishment, caused e.g. by a lengthy recruitment process or maternity breaks. New jobs are the shorter, the older the establishment is: an increase in age by one year increases the hazard ratio by more than 2% relative to the baseline.

The state of the business cycle at the time of the job creation shows a strong statistical relationship with the survival chances of the job. If the job was created in a downturn – i.e. the sectoral unemployment rate was high – then the job survives longer, particularly in continuing establishments, than a job created in an upturn. Increasing the sectoral unemployment rate by 1 percent is estimated to lower the hazard rate by

between 1 and 5 percent.[7] However, the regional unemployment rate does not appear to effect the survival of newly created jobs. This pattern is robust across specifications, be it the survival of the first job, of a typical job, or the survival of all newly created jobs.

A job survives longer, if the job or the establishment was created in a recession than if it was created in a boom. What might explain such a result? It could be that successful establishments expand at all times – even in recessions – and we might measure the effect of successful establishments only. This is an unlikely explanation, since we control for the expansionary path of the establishments over the last two years and we do not find an association with recent job hires and the survival of the new jobs. The survival may relate to the quality of the expansion, because higher real interest rates in recessions select only the most promising investment opportunities. In addition, the average skill of the unemployed is greater in a recession than in a boom and new hires would have more skills and the project might therefore be more successful.

Alternatively, the association of the business cycle and the survival of jobs might be a spurious phenomenon, caused by the momentum of the business-cycle. It could be the case that jobs created in (a later phase of) a recession survive longer only because economic conditions improve soon after creation. In contrast, jobs created in a boom face adverse economic conditions relatively sooner than jobs created in a recession.. In order to explore this argument, we look at a particular feature of the Cox model. Under the proportional hazard assumption, explanatory variables have a proportional impact on the baseline hazard: this proportional impact should be the same regardless of the duration of the job. If the business cycle effect is due to these specific ups and downs of demand conditions at the very time of job creation, then this impact should disappear after some time. Note that we do control for general demand conditions by including calendar time dummy variables.

[7] Pure industry effects cannot be responsible for this result, because we also control for time and sector fixed effects.

Figure 2

Figure 3

The best way to test such a hypothesis is to test for the proportional hazard property. Due to our big sample size, tests of the proportional hazard assumption reject this assumption for the business-cycle indicator.[8] To get some feeling about violations of the proportional hazard assumption we try two simple parametric formulations to augment the existing Cox model to include a time-varying impact of the business-cycle variables over the duration of the hazard.

In Figures 2 and 3 we plot estimated hazard rates (based on the average duration of new jobs) holding all variables at their mean, but for the sectoral and regional unemployment rates. The unemployment rates are set to a high rate, which is one standard deviation above the mean, and to a low rate, which is one standard deviation below the mean. We further interact all variables with time (the top panels in both Figures) and also with the log of time (bottom panels), to allow for a differing effect of the unemployment rates over time.

The Figures give the shape of the baseline hazard; in all four panels we detect an increased hazard for the period following the creation of the job. The hazard peaks after about 7 quarters in existing firms, and after about 9 quarters in entering firms. The hazard decreases thereafter; there is a relatively small secondary peak after some 66 quarters after the creation of the job in entering firms. The hazard rate for jobs in existing firms is estimated to be higher than in entering firms, e.g. the peak for existing firms is around 0.14 and about 0.058 for entering firms.

[8] The test involves testing the null hypothesis of a non-zero slope in a generalized regression of the scaled Schoenfeld residuals on functions of time (Grambsch and Terneau, 1994). Testing for a zero slope is equivalent to testing that the log hazard ratio function is constant over time, the rejection of the null indicates a deviation from the proportional hazards assumption.

Comparing the effect of the business cycle, we see that the hazards are consistently greater when unemployment was low at the time of job creation rather than high. The differences in the hazards associated with high or low unemployment at the time of job creation become somewhat smaller with the passing of time. However, the impact of the business cycle at the time of job creation does not disappear after five to ten years; it is a long-term effect.

5 Summary and Conclusions

The dynamics of job creation has received a lot of attention both from macro and from labor economists. This attention has concentrated on the simultaneous creation and destruction of jobs, as well as on their cyclical determinants. On the other hand, the literature in industrial organization has concentrated its interest on firm creation, growth and survival. In this paper we look at the persistence of job creation. Job creation is a manifestation of firm expansion; it is easier to measure than other forms of capacity expansion. The creation of jobs is a prime concern for economic policy where the creation of new jobs is considered a sustainable way of reducing unemployment, e. g. the New Deal (UK), or similar welfare-to-work programs.

What kind of job creation is persistent? It turns out that jobs created in large job creations survive longer than jobs where only one new job has been created. This seems to support the lumpy adjustment cost theory: the adjustment of employment to an optimal level has fixed costs, which are irrespective of the size of the adjustment. Jobs created by entering establishments last considerably longer than new jobs in continuing establishments. Jobs that persist over time were predominantly filled by female, white-collar, and prime-age workers at the time of creation.

A job is of considerably longer duration if the job was created in a period of adverse macroeconomic conditions (i. e. when unemployment was high). At first glance this result seems counter-intuitive: investment as well as firm expansions are rare in recessions, because the investment cycle is more volatile than the overall business cycle. The reason for the persistence must be caused by the structural differences of such expansions: high interest rates could deter bad projects, high unemployment rates may

increase the pool of available good workers. Because we use sectoral variation in unemployment rates and time dummy variables to capture general changes over the two decades, we are more convinced by the explanation the labor market offers. Interest rates will apply to all sectors equally; the supply of qualified workers (possibly with sector-specific human capital) is related to the sector-specific business-cycle. Moreover, the effect of the business-cycle at the time of job creation is not short-lived. The survival rates of new jobs created in bad times are consistently above those created in good times, even ten years after the job creation. This final observation re-enforces the structural difference of such new jobs.

Our results have clear policy implications. We found that new jobs with entering firms are more persistent than those with continuing firms. The removal of entry hurdles is thus a clear priority for economic policy. In case governments dither between subsidizing new jobs in already existing firms or funding start-up programs, the money should best go to new enterprises: as the data show, they tend to do business in new sectors (and the jobs in the service sectors are amongst the most persistent), using possibly highly educated workers, and create jobs that last on average almost 50 per cent longer than those created in already existing companies.

Conclusions about macro economic policies are more difficult to draw, because the differences in the survival of the new jobs may be caused by selection. If the new jobs created in recessions are more stable because projects and the pool of available workers are better, then an argument for dampening the business cycle could be made. By reducing business cycle volatility social gains in terms of more stable jobs could be made. As the stability of jobs created in a recession is only caused by structural effects, any smoothing of the business cycle will, in turn, reduce these effects: i.e. if there less business cycle volatility, the quality of workers and projects in a recession will be relatively better. Apart from the usefulness of countercyclical macro policy, our results are also important for banking and finance institutions: Insofar as the negative correlation between the business cycle and the duration of newly created jobs can be extended to the persistence and profitability of business investment, stockholders and creditors can base their investment decisions on this information.

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Table 1: Sample summary statistics, by establishment type.

	Continuing		New		Re-entering	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Absolute job creation	2.359	6.115	1.542	2.308	1.546	3.813
Employment *t*	27.161	92.567	1.542	2.308	1.546	3.813
Employment *t-1*	24.801	89.822	·	·	·	·
Job creation, relative to Employment *t-1* (in %)	21.695	16.842	·	·	·	·
Employment growth *(t-4, t-1)*(in %)	-0.500	72.354	·	·	·	·
Employment growth *(t-8, t-4)* (in %)	9.359	81.116	·	·	·	·
Created only one new job (=1)	0.654	0.476	0.764	0.425	0.840	0.366
Employment *t-2* = Employment *t* (=1)	0.169	0.375	·	·	0.350	0.477
Only one new job * Employment *t-2* = Employment *t* (=1)	0.143	0.350	·	·	0.319	0.466
Median wage old workers [a)]	565.056	219.467	·	·	·	·
Churning (in %)	7.012	14.450	·	·	·	·
Characteristics of new hires:						
Median wage new workers [a)]	429.341	247.222	455.889	291.953	359.872	225.571
Workers aged under 25/All new hires (in %)	0.508	0.429	0.251	0.404	0.236	0.404
Workers aged 25-50/All new hires (in %)	0.444	0.422	0.654	0.443	0.641	0.457
Workers aged 50+/All new hires (in %)	0.047	0.178	0.094	0.276	0.121	0.315
Blue collar workers / All new hires (in %)	0.443	0.452	0.327	0.453	0.553	0.485
Female workers / All new hires (in %)	0.453	0.444	0.562	0.471	0.606	0.470
Age of firm	10.844	6.958	0	0	8.511	6.417
Age left-censored in 1972 (=1)	0.484	0.500	·	·	0.240	0.427
Business cycle indicators:						
Average sectoral unemployment rate last 12 months	4.272	1.632	4.535	1.615	4.563	1.567
Average regional unemployment rate last 12 months	4.892	2.415	4.862	2.366	5.407	2.679
Sectors:						
Energy, water	0.010	0.101	0.003	0.056	0.008	0.091
Food, beverage, tobacco	0.069	0.253	0.015	0.120	0.022	0.147
Textiles and clothing	0.036	0.186	0.016	0.127	0.026	0.159
Wood and paper	0.105	0.306	0.039	0.194	0.056	0.231
Chemical products	0.039	0.194	0.014	0.117	0.023	0.149
Metal and metalworking	0.107	0.309	0.043	0.203	0.037	0.188
Wholesale and retail trade	0.399	0.490	0.448	0.497	0.370	0.483
Banking and insurance	0.028	0.165	0.014	0.119	0.007	0.086
Other private services	0.208	0.406	0.408	0.491	0.450	0.497
N	143,953		24,158		18,403	

Notes:

Variables refer to the period of the job creation episode.

[a)] Wages are daily earnings in 1995 Austrian Schilling (ATS), deflated using the Consumer Price Index.

Table 2: Estimated Hazard Ratio of the time until the first new job is lost (Cox).

	Continuing firms	New firms	Re-entering firms	All firms
Relative job creation	0.9991			
	(0.0002)			
Absolute job creation		1.0086	1.0108	1.0025
		(0.0030)	(0.0016)	(0.0004)
Churning	1.0014			
	(0.0002)			
Employment *t-1*	0.9998			
	(0.0000)			
Employment growth *(t-1, t-4)*	0.9999			
	(0.0000)			
Employment growth *(t-4, t-8)*	0.9999			
	(0.0000)			
Created one job	0.8183	0.9725	0.6039	0.8037
	(0.0055)	(0.0186)	(0.0142)	(0.0045)
Employment *t-2=t*	0.9627			
	(0.0170)			
One job * (Employment *t-2=t*)	0.9245			
	(0.0181)			
Re-entering firm				0.7067
				(0.0084)
New firm				0.5613
				(0.0066)
Median wage new workers	1.0000	0.9994	0.9999	0.9999
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Median wage incumbent workers	0.9996			0.9997
	(0.0000)			(0.0000)
Fraction of new workers younger 25 in new workers	1.0853	1.2169	1.1608	1.1192
	(0.0083)	(0.0227)	(0.0239)	(0.0073)
Fraction of new workers over 50 in new workers	1.1079	1.0862	1.2075	1.1237
	(0.0180)	(0.0292)	(0.0316)	(0.0135)
Fraction of new blue-collar workers in new workers	1.1250	1.2090	1.0126	1.1236
	(0.0080)	(0.0217)	(0.0201)	(0.0067)
Fraction of new female workers in new workers	0.9905	0.8497	0.9395	0.9774
	(0.0073)	(0.0151)	(0.0182)	(0.0061)
Age of firm (years)	1.0275			
	(0.0018)			
Age*age/100	0.9324			
	(0.0065)			
Firm existed in 1972	1.0599			
	(0.0091)			
Sectoral unemployment rate	0.9577	0.9754	0.9839	0.9615
	(0.0080)	(0.0266)	(0.0287)	(0.0073)
Regional unemployment rate	1.0017	1.0010	1.0177	1.0046
	(0.0035)	(0.0090)	(0.0177)	(0.0030)

(Table 2 continued)

Sector controls (9 dummy variables)	included	included	included	included
Region (129 dummy variables)	included	included	included	included
Season (3 dummy variables)	included	included	included	included
Year (20 dummy variables)	included	included	included	included
N	143,952	24,158	18,403	191,585
log-likelihood	-1430543.2	-176186.05	-141985.01	-1911680.5

Notes:
Standard errors in parentheses.

Table 3: Estimated Hazard Ratio of the time until the average new job is lost (Cox).

	Continuing firms	New firms	Re-entering firms	All firms
Relative job creation	0.9968			
	(0.0002)			
Absolute job creation		0.9883	1.0145	0.9970
		(0.0058)	(0.0016)	(0.0006)
Churning	1.0019			
	(0.0002)			
Employment *t-1*	0.9999			
	(0.0000)			
Employment growth *(t-1, t-4)*	0.9999			
	(0.0001)			
Employment growth *(t-4, t-8)*	0.9999			
	(0.0000)			
Created one job	1.2772	1.5894	0.8704	1.2221
	(0.0090)	(0.0371)	(0.0208)	(0.0075)
Employment *t-2=t*	1.0674			
	(0.0199)			
One job * (Employment *t-2=t*)	0.8258			
	(0.0169)			
Re-entering firm				0.6858
				(0.0083)
New firm				0.5353
				(0.0064)
Median wage new workers	0.9999	0.9994	0.9999	0.9999
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Median wage incumbent workers	0.9995			0.9996
	(0.0000)			(0.0000)
Fraction of new workers younger 25 in new workers	1.0690	1.2212	1.1526	1.1128
	(0.0083)	(0.0232)	(0.0239)	(0.0073)
Fraction of new workers over 50 in new workers	1.1342	1.0726	1.2148	1.1319
	(0.0185)	(0.0293)	(0.0319)	(0.0137)
Fraction of new blue-collar workers in new workers	1.1443	1.2182	1.0181	1.1441
	(0.0083)	(0.0224)	(0.0203)	(0.0069)
Fraction of new female workers in new workers	0.9782	0.8410	0.9322	0.9699
	(0.0073)	(0.0152)	(0.0182)	(0.0061)
Age of firm (years)	1.0238			
	(0.0018)			
Age*age/100	0.9436			
	(0.0068)			
Firm existed in 1972	1.056			
	(0.0093)			
Sectoral unemployment rate (in %)	0.9487	0.9501	0.9966	0.9547
	(0.0082)	(0.0269)	(0.0294)	(0.0075)
Regional unemployment rate (in %)	1.0047	1.0048	1.0158	1.0072
	(0.0036)	(0.0093)	(0.0100)	(0.0031)

(Table 3 continued)

Sector controls (9 dummy variables)	included	included	included	included
Region (129 dummy variables)	included	included	included	included
Season (3 dummy variables)	included	included	included	included
Year (20 dummy variables)	included	included	included	included
N	143,952	24,158	18,403	191,585
log-likelihood	-1,359,046.4	-166,119.63	-139,884.28	-1,822,486.5

Notes:
Standard errors in parentheses.

Table 4: Estimated hazard of the time until the total job creation is lost (Cox).

	Continuing firms	New firms	Re-entering firms	All firms
Relative job creation	0.9963			
	(0.0002)			
Absolute job creation		0.9834	1.0142	0.9935
		(0.0061)	(0.0017)	(0.0007)
Churning	1.0019			
	(0.0002)			
Employment *t-1*	0.9999			
	(0.0000)			
Employment growth *(t-1, t-4)*	0.9999			
	(0.0001)			
Employment growth *(t-4, t-8)*	0.9999			
	(0.0000)			
Created one job	1.5027	1.8036	1.0552	1.4216
	(0.0107)	(0.0429)	(0.0253)	(0.0088)
Employment *t-2=t*	1.0937			
	(0.0204)			
One job * (Employment *t-2=t*)	0.8094			
	(0.0165)			
Re-entering firm				0.6904
				(0.0083)
New firm				0.5451
				(0.0066)
Median wage new workers	0.9999	0.9995	0.9999	0.9999
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Median wage incumbent workers	0.9995			0.9996
	(0.0000)			(0.0000)
Fraction of new workers younger 25 in new workers	1.0610	1.2218	1.1501	1.1082
	(0.0083)	(0.0232)	(0.0239)	(0.0073)
Fraction of new workers over 50 in new workers	1.1335	1.0716	1.2131	1.1297
	(0.0185)	(0.0293)	(0.0318)	(0.0137)
Fraction of new blue-collar workers in new workers	1.1368	1.2159	1.0120	1.1389
	(0.0083)	(0.0223)	(0.0202)	(0.0069)
Fraction of new female workers in new workers	0.9771	0.8436	0.9347	0.9705
	(0.0073)	(0.0152)	(0.0182)	(0.0061)
Age of firm	1.0215			
	(0.0018)			
Age*age/100	0.9493			
	(0.0069)			
Firm existed in 1972	1.0516			
	(0.0092)			
Sectoral unemployment rate	0.9481	0.9478	0.9974	0.9545
	(0.0082)	(0.0268)	(0.0294)	(0.0075)
Regional unemployment rate	1.0048	1.0043	1.0166	1.0073
	(0.0036)	(0.0093)	(0.0100)	(0.0031)

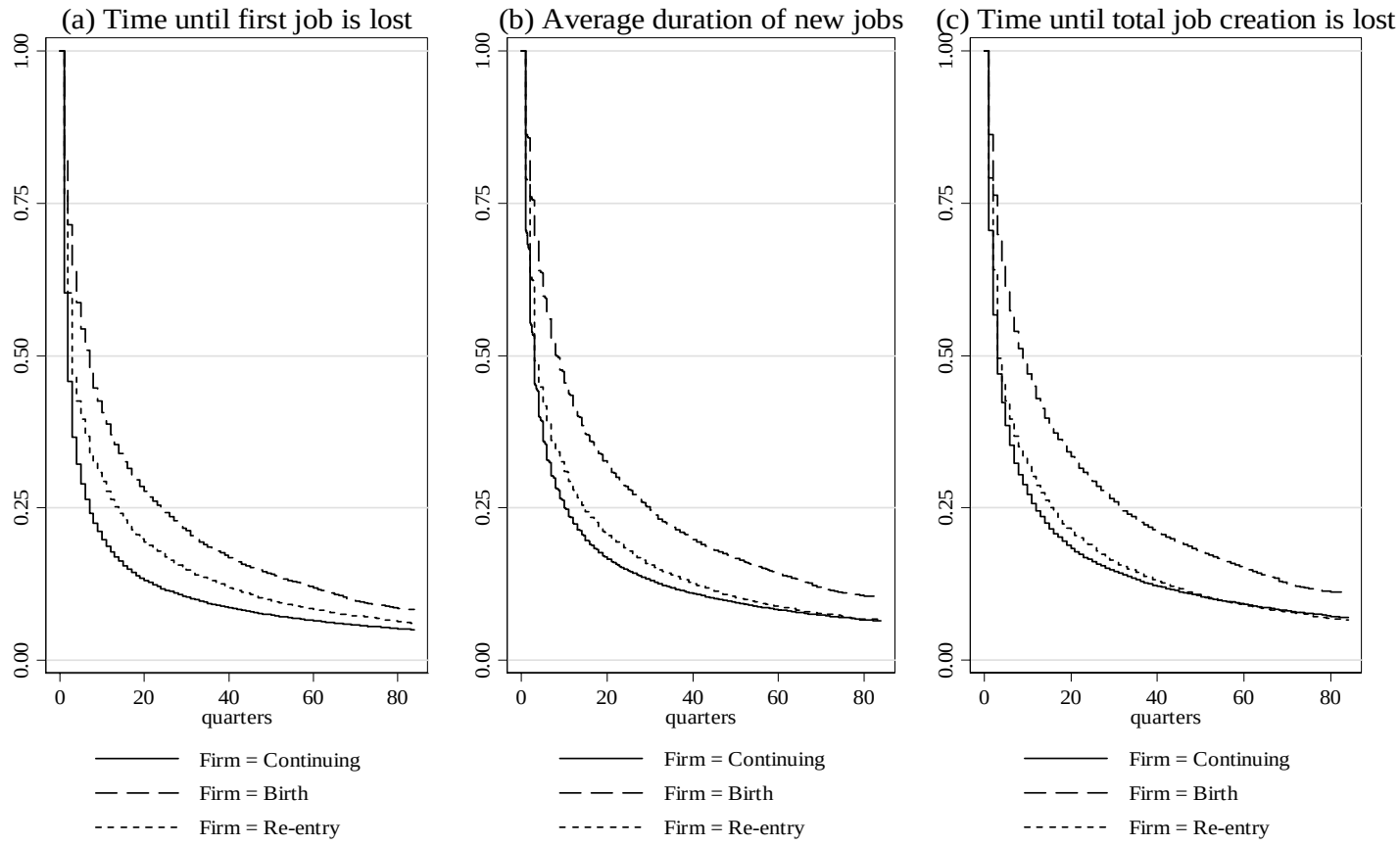
(Table 4 continued)

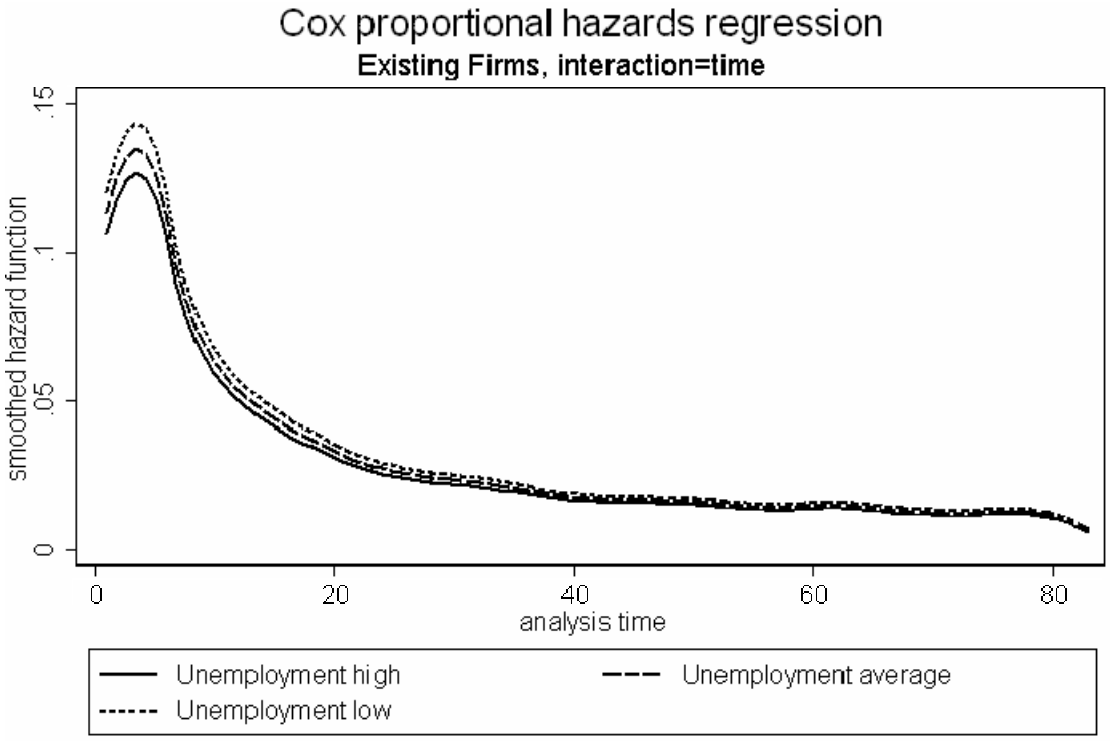
Sector controls (9 dummy variables)	included	included	included	included
Region (129 dummy variables)	included	included	included	included
Season (3 dummy variables)	included	included	included	included
Year (20 dummy variables)	included	included	included	included
N	143,952	24,158	18,403	191,585
log-likelihood	-1,359,860.4	-166,009.0	-140,125.1	-1,823,589.2

Notes:
Standard errors in parentheses.

Figure 1

Kaplan-Meier estimates of the survival of job creation: Continuing firms and entries





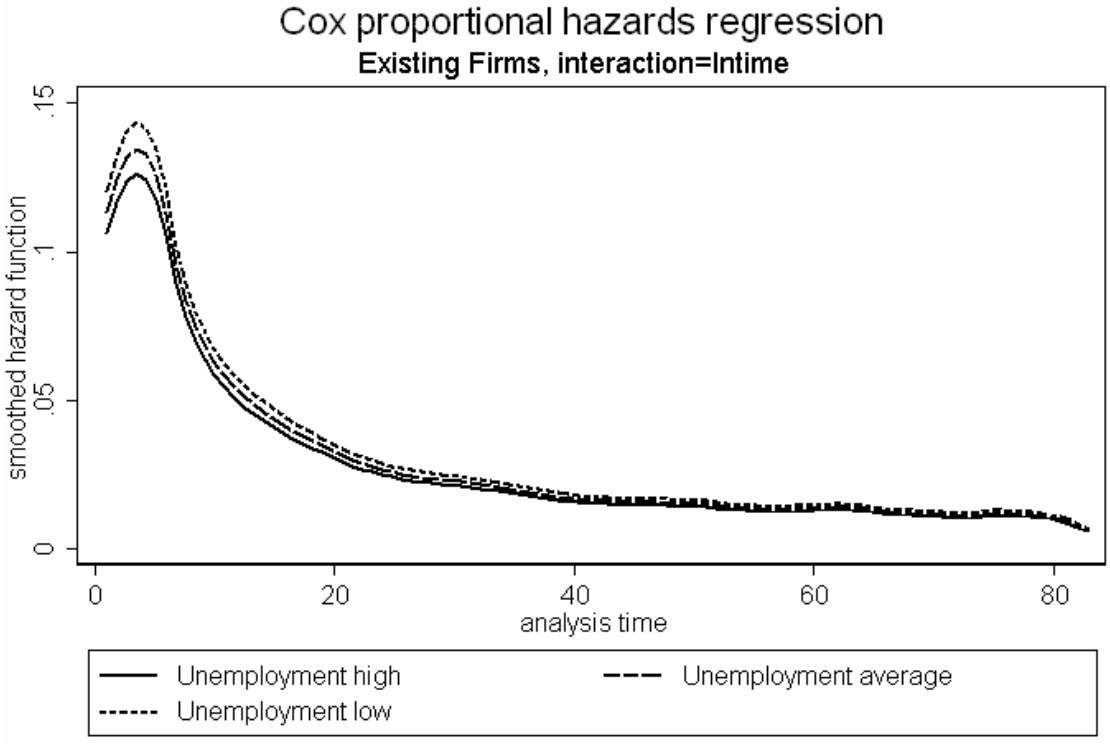
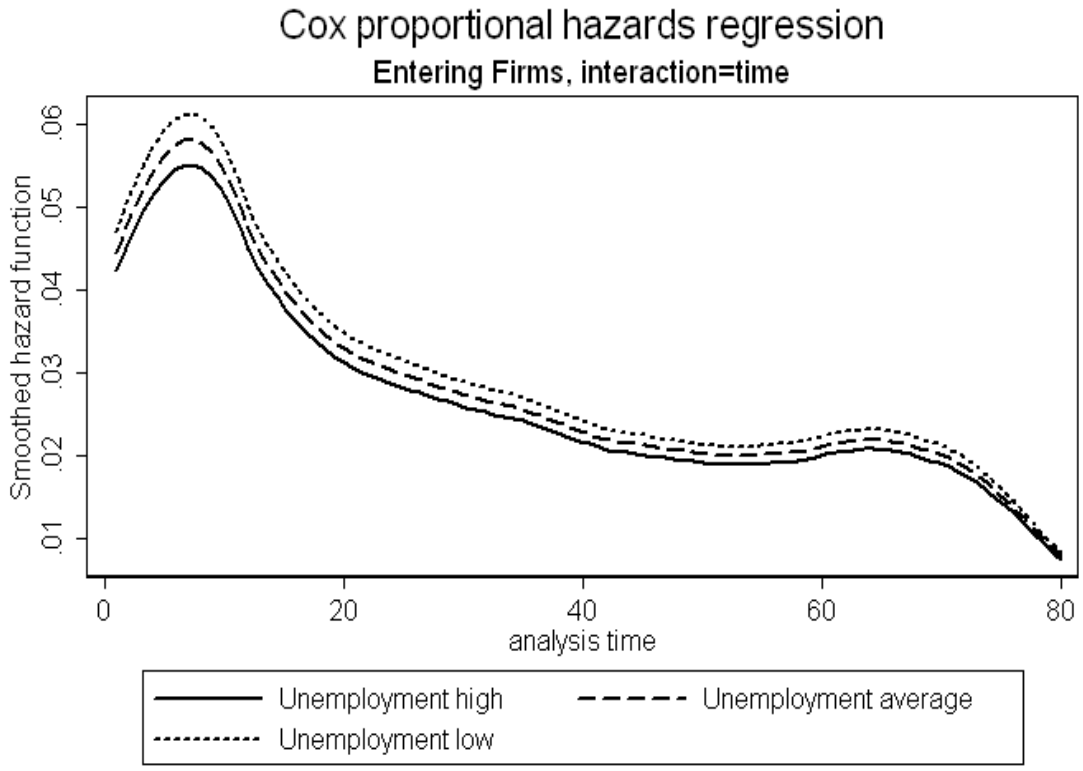


Figure 2: Estimated hazard rates, existing firms.



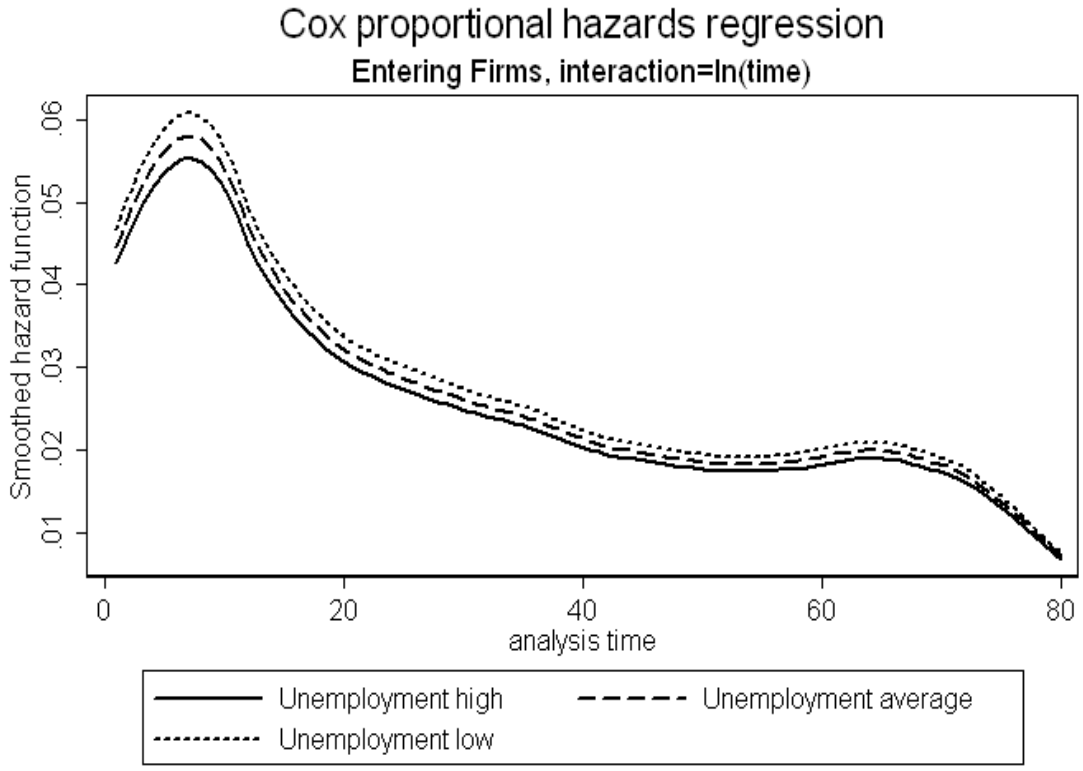


Figure 3: Estimated hazard rates: entering firms.