Employers' Selection Behavior during Short-Time Work

Theresa Scholz

Institute for Employment Research

Abstract

This paper analyzes whether employers select certain individuals into short-time work. Special focus is given on the effect of the individual level of human capital on the risk of working short-time. As a competing risk, transitions to unemployment are taken into account. The analysis is based on a unique data set on short-time workers in the district of the employment agency of Nuremberg. We use methods of event history analysis to estimate transition rates to short-time work and unemployment, respectively. Our results do not indicate selective behavior of employers with respect to short-time work. A low level of human capital is associated with an increased risk of entering unemployment.

JEL classification: J23, J24, J3

Keywords: short-time work, individual data, event history analysis

Contents

1 Introduction

During the last recession of 2008-09 Germany experienced a huge decrease in GDP. Surprisingly, employment remained relatively stable. Germany's so called labor market miracle and the intensive usage of short-time work (STW) schemes has sparked renewed interest in this labor hoarding instrument. In May of 2009 about 56.000 thousand establishments made used of the program, and STW compensation was paid to about 1.4 million employees.

For a range of countries macro data on STW (see Hijzen/Venn (2011)) and for some micro data on the establishment level is available. Individual data on short-time workers is, however, scarce. Therefore, knowledge about individuals affected by STW is limited. To this day it is not clear whether short-time workers possess certain individual characteristics, and to what extent they are affected by STW.

In this paper, we provide insight on the question of short-time workers individual characteristics. We ask whether employers select certain groups of individuals for STW. Special focus is given on the effect of the level of individual human capital on the risk of working short-time. Applying methods of event history analysis, we estimate transition rates from regular employment to short-time work as a function of individual and establishment characteristics. Our analysis is restricted to short-time workers according to §§ 169ff of Book Three of the German Social Code (*"Konjunkturelle Kurzarbeit"*). Faced with a considerable lack off work, employers may decide to reduce the number of workers instead of implementing a STW scheme. Being laid-off hence represents the competing risk to STW; transition rates to unemployment are estimated separately.

The remainder of the paper is organized as follows. Considerations on the selection behavior of employers from a theoretical point of view are presented in section 2. After providing information on the data used in the analysis in section 3, we explain our empirical strategy in section 4. Section 5 deals with the identification of the establishments whose employees are to be included in the further analysis. Results from the descriptive as well as the regression analysis are provided in section 6.2 and 6.3, respectively. The conducted robustness checks are laid out in section 6.4. Section 7 concludes.

2 Theoretical Considerations

Suppose a representative establishment[1] experiences an inescapable lack of work due to an exogenous shock. The establishment employs skilled and unskilled workers, where skilled workers dispose of a high level of human capital. Here, human capital may refer to firm-specific knowledge as well as the level of formal qualification. Suppose further that both groups of employees practice the same tasks. Skilled workers are, however, more productive. Hence, their exogenously given wage rate exceeds that of unskilled workers.

We assume that the lack of work is equally distributed across both groups of workers. Facing the necessity to cut the volume of work, the establishment must decide between adjusting the number of employees and reducing working hours by implementation of a STW scheme. During STW lay-offs due to the occurring lack of work are ruled out by jurisdiction. The establishment may therefore only opt for one regime[2]. In case of lay-offs adjustment cost accrue to the firm. These include the cost for lay-offs (e.g. severance pays) as well as search and training cost for future re-hiring of workers (Hamermesh

[1] In the following, the terms establishment and firm will be used interchangeably.

[2] German jurisdiction ruled that during STW employers are only allowed to lay-off workers for reasons relating to the individual worker or operational reasons other than those that led to the implementation of STW.

(1989)). In case of STW employers are obliged to cover their share as well as employees' share of contributions to social security for the hours cut (Federal Employment Agency (2009)). The amount of contributions is determined by the wage rate and is hence higher for skilled workers. These additional contributions to social security represent the cost of STW accruing to the firm[3]. The employer will opt for the regime that generates the larger sum of present and future expected discounted profits.

In case the establishment opts for the implementation of STW, it must decide which employees will work short-time. We argue that the establishment will decide to cut the hours of unskilled workers. This behavior is caused by the additional contributions to social security during STW. Since these depend on the wage rate, employing skilled workers in short-time is relatively costly. The establishment hence faces incentives to achieve the necessary reduction in output by cutting hours of unskilled workers. From these theoretical considerations, we conduct that workers with a low level of human capital face a higher risk of working short-time.

In the following, we will therefore analyze the influence of employees' individual level of human capital on the risk of working short-time using methods of event history analysis. As a competing risk unemployment is taken into account.

3 Individual Data on Short-Time Workers

Our analysis is based on an individual data set of short-time workers (according to §§ 169ff of Book Three of the German Social Code, *"Konjunkturelle Kurzarbeit"*) in the district of the employment agency of Nuremberg[4] (hereafter simply referred to as Nuremberg). Establishments conducting STW are obliged to submit paper copies of lists of all employees working short-time to the responsible local employment agency. All lists submitted to the employment agency of Nuremberg were typewritten. In doing so, a data set was constructed, which provides monthly information on two thirds of all employees working short-time in Nuremberg between June 2008 and December 2010.[5] As the transcribed lists stems from the process of public administration, workers' social security number and firms' establishment number are contained in the data set. It is hence possible to combine the short-time worker data with existing administrative data.

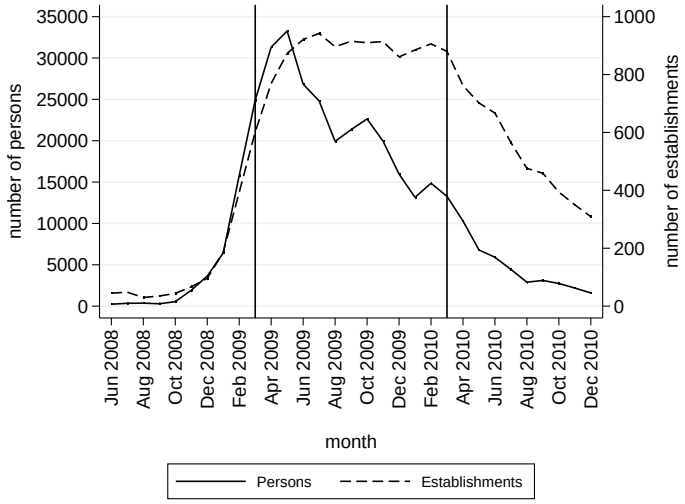
Since the transcription of all relevant lists was scheduled to require approximately 1.5 years, the analysis presented in this paper is based on the transcription of about ninety percent of all data material to be typewritten, which amounts to 57.057 short-time workers employed in 1.820 establishments (hereafter referred to as STW establishments). The development of STW in Nuremberg is displayed in figure 1. In the first quarter of 2009 we observe a sharp increase of both the number of short-time workers and STW establishments. The highest number of short-time workers is observed in May 2009, the number of STW establishments reaches its maximum in July 2009. While the number of short-time workers plummets quickly after its peak, the number of STW establishments remains relatively stable until March 2010. For this reason, we divide the observed time span into three phases: the STW expansion period from June 2008 to March 2009, the STW plateau period from April 2009 to March 2010 and the STW contraction period from April 2010 to December 2010. On average,

[3] In 2009 and 2010 part of this payment was reimbursed by the Federal Employment Agency. Nonetheless, additional cost accrue to the employer.

[4] The district of the employment agency of Nuremberg comprises Nuremberg, Erlangen, Fuerth, Lauf, Schwabach and parts of Roth.

[5] Approximately one third of short-time workers located in Nuremberg are not included in the data, since their firm's payroll accounting is located outside the district of the employment agency. Lists for these short-time workers were submitted to other regional employment agencies and were therefore not available for transcription.

Figure 1: Development of Short-Time Work in the District of Nuremberg



Source: Own calculations.

individuals in Nuremberg were affected by STW for 6 months. 22 percent of all employees covered in the data experienced an interruption of the individual period of STW[6]. The development of STW in the district of the employment agency of Nuremberg strongly resembles the development in all of Germany (Statistic of the Federal Employment Agency (2011)).

Furthermore, the structure of Nuremberg's STW establishments does not deviate too much from all German STW establishments (Statistic of the Federal Employment Agency (2011)). 80 percent of Nuremberg's STW establishments employed at most 50 workers in 2008. 16 percent were medium sized with 50 to 250 workers and 4 percent employed more than 250 workers. Two thirds of the STW establishments located in Nuremberg can be assigned to manufacturing (40 percent), trade or repair (17 percent) or construction (10 percent)[7]. Due to the striking similarities in the usage of STW and only small differences in the structure of STW establishments, we argue that our analysis is not subject to influences strongly particular to the Nuremberg region.

4 Empirical Strategy

Our empirical analysis examines whether the risk of STW differs across groups of employees. Based on our theoretical considerations presented in section 2, we hypothesize a negative influence of the level of individual human capital on the risk of working short-time. Note that establishments experiencing an inescapable lack of work may conduct lay-offs instead of implementing a STW scheme. In order to complete our analysis, we therefore take into account unemployment as a competing risk.

Our empirical strategy follows a two-stage approach. The first stage aims at identifying establishments without a STW scheme, but characteristics similar to STW establishments (in the following referred to as similar non-STW establishments). We do so for two reasons.

First, we argue that the risk of working short-time is not restricted to employees of establishments that actually implemented STW. In case a non-STW establishment was provided with the possibility

[6] Here, an interruption is defined as a pause of STW of more than two months.

[7] These numbers stem from merging the short-time worker data with the Establishment History Panel (BHP) 2008 of the Institute for Employment Research, and are based on 1.688 STW establishments found in the BHP. Detailed information on the BHP is provided in Hethey-Maier/Seth (2010).

to conduct STW, its employees were at risk of working short-time. In order to capture the correct risk pool of employees it is thus decisive to include employees of establishments that actually opted for STW as well as workers of establishments that **may have** done so. Legislation requires the occurrence of an inescapable lack of work[8] for STW to be implemented. We argue that the crisis affected STW and similar non-STW establishments equally. The latter would therefore fulfill the prerequisite of an inescapable lack of work.

Second, we want to take into account unemployment as a competing risk to STW. While implementing STW, establishments are not allowed to conduct lay-offs as a measure to adjust to the occurring lack of work. Therefore, restricting our analysis to workers of STW establishments would not allow us to estimate the true risk of unemployment. Only when employees of similar non-STW establishments are included in the risk pool, it is justified to consider unemployment as a competing risk to STW.

In the second stage of our empirical analysis we employ methods of event history analysis to estimate transition rates to STW and unemployment. The risk pool consists of employees of STW- and non-STW establishments.

5 Identification of Establishments

Non-STW establishments similar to STW establishments are identified by methods of propensity score matching[9]. Non-STW establishments serving as matches for STW establishments will possess similar features. The Establishment History Panel (BHP) provided by the Research Data Center of the German Federal Employment Agency serves as a database for the matching process. It contains yearly information on establishments in Germany with at least one employee on June 30th. A detailed description is provided in Hethey-Maier/Seth (2010). From the BHP we select all establishments located in the district of the employment agency of Nuremberg. Merging the information from the BHP with the short-time worker data described in section 3 enables us to distinguish establishments with and without a STW scheme.

Since we are interested in finding only those non-STW establishments that closely resemble STW establishments, we carry out a nearest neighbor matching using the psmatch2 Stata module (Leuven/Sianesi (2003)). Firms which implemented STW represent the treatment group. Within a caliper of 0.1 two nearest neighbors are matched with replacement to each STW establishment. The matched sample is restricted to establishments within the common support. We choose a logit model to estimate the propensity score, since it has a larger probability mass at its margins than the probit model. In a binary treatment case the two models, however, produce similar results (Caliendo/Kopeinig (2008)).

The propensity score is estimated using the following variables measured in 2008. We control for the branch of economic activity, since the last recession caused varying loss of work across the branches. The establishment's age is controlled for by inclusion of the year of foundation. The lack of experience with the implementation of STW in younger firms may render them more reluctant to implement this instrument (Boeri/Bruecker (2011)). The total number of employees reflects firm size, which was found to positively influence STW take-up (rates) in earlier studies (Boeri/Bruecker (2011), Crimmann/Wiessner/Bellmann (2010)). A high share of full-time workers as well as a low share of part-time and marginally employed workers leaves less flexibility to the establishment rendering STW

[8] An inescapable lack of work is defined as a wage cut of at least ten percent affecting at least one third of all employees.

[9] Caliendo/Kopeinig (2008) give an introduction to propensity score matching. A more detailed description can be found in Guo/Fraser (2010).

more likely. The educational and occupational structure of the workforce is accounted for by shares of the respective subgroups of employees[10]. The results are displayed in table 1.

Table 1: Estimation of the Propensity Score (Logit Model)

Implementation of STW scheme		
Agriculture, forestry and fishing	-1.8360***	(-4.05)
Manufacturing	1.3765***	(23.91)
Electricity, gas, steam and air conditioning supply	-1.4727	(-1.66)
Accommodation and food service activities	-1.4545***	(-6.77)
Financial and insurance activities	-2.0286***	(-4.91)
Real estate activities	-3.1388***	(-5.41)
Public administration and defence; compulsory social security	-3.7200**	(-3.20)
Education	-2.0352***	(-4.69)
Human health and social work activities	-2.2988***	(-8.41)
Arts, entertainment and recreation	-1.3104***	(-3.42)
Other service activities	-1.5985***	(-6.83)
Activities of households as employers; undifferentiated goods- and services-production	-4.0910***	(-4.08)
Year of foundation	-0.0176***	(-7.74)
Total number of employees	0.0011***	(7.61)
Share of full-time employees	2.0491***	(6.05)
Share of part-time employees	-0.3679	(-1.48)
Share of marginally employed	-0.1608	(-0.96)
Share of qualified employees	-0.1112	(-1.35)
Share of high qualified employees	0.6172***	(3.67)
Share of unskilled workers	-0.7360	(-1.87)
Share of skilled workers	-0.3951	(-0.97)
Share of craftsmen and foremen	-0.9820	(-1.85)
Share of white-collar employees	-0.9636*	(-2.42)
Constant	31.3556***	(6.93)
Observations	44899	
Pseudo R^2	0.207	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

According to our estimation, younger and smaller firms are indeed less likely to implement a STW scheme. As expected the share of full-time employees strongly increases the probability of belonging to the treatment group. The same is true for the share of high qualified and white-collar employees. Note that this result does not contradict the theoretical considerations presented in section 2, since it only refers to the influence of the employment structure on the probability of implementing a STW scheme. At this point of the empirical analysis no prediction can yet be made about the characteristics of individuals affected by STW.

The matching procedure successfully reduced the bias between STW and non-STW establishments. Caliendo/Kopeinig (2008) state that the standardized bias after matching should lie below 5%, which we achieve for all covariates. The mean of the absolute bias is reduced from 36.4 before to 1.2 after matching (see table 2), the pseudo R^2 decreases from 0.207 to 0.002. In the matched sample the

[10] Qualified employees either hold a secondary school leaving certificate as their highest school qualification or completed vocational training. High qualified employees hold a degree from a university (of applied sciences). The shares of unskilled workers, skilled workers, craftsmen and formen as well as white-collar employees refer to the occupational status of the employees.

probability of implementing STW at the establishment level can thus no longer be explained by the variables included in the matching process. After excluding establishments off support our matched

Table 2: Bias Reduction by Propensity Score Matching

Summary of the distribution of the abs(bias)				
BEFORE MATCHING				
	Percentiles	Smallest		
1%	,629896	,629896		
5%	9,895412	9,895412		
10%	12,51245	12,51245	Obs	23
25%	14,40584	14,12704	Sum of Wgt.	23
50%	27,10472		Mean	36,43539
		Largest	Std. Dev.	28,1826
75%	48,55275	79,19888		
90%	85,31349	85,31349	Variance	794,259
95%	92,05005	92,05005	Skewness	1,037202
99%	99,72161	99,72161	Kurtosis	2,901839
AFTER MATCHING				
	Percentiles	Smallest		
1%	0	0		
5%	,1670358	,1670358		
10%	,2745	,2745	Obs	23
25%	,352797	,3121618	Sum of Wgt.	23
50%	,8225082		Mean	1,180741
		Largest	Std. Dev.	1,222333
75%	1,533282	1,684041		
90%	1,697368	1,697368	Variance	1,494098
95%	4,489232	4,489232	Skewness	2,028935
99%	4,856711	4,856711	Kurtosis	6,573173

Sample	Pseudo R^2	LR chi^2	$p > chi^2$
Unmatched	0,207	2978,66	0,000
Matched	0,002	8,25	0,996

sample containes 1.683 STW and 2.779 non-STW establishments.

In the next step of our empirical analysis we estimate transition rates from regular employment to STW and unemployment, respectively. The risk pool is formed by all workers of STW and matched non-STW establishments. Due to the preceding nearest neighbor matching, additional variance is introduced to the estimation process as a whole (Caliendo/Kopeinig (2008)). In practice, bootstrapping methods to estimate standard errors are widely applied, although Imbens (2004) states that there is little formal evidence for this. Abadie/Imbens (2008) show that the standard bootstrap is in general not valid for matching estimators, even in the simple case with a single continuous covariate when the estimator is root-N consistent and asymptotically normally distributed with zero asymptotic bias.

We match STW- and non-STW establishments for the purpose of including employees of the latter in our regression analysis rather than to obtain matching estimators such as the average treatment effect on the treated. Still, we do not apply methods of bootstrapping to adjust the variance of our regression results as Abadie/Imbens (2006) state that standard conditions for the bootstrap are not

satisfied due to the extreme non-smoothness of nearest neighbor matching. Standard errors of our regression analysis therefore underestimate the true variance, since the additional variance introduced by the matching procedure is not accounted for.

6 Empirical Analysis of Transition Rates

6.1 Data Preparation

The analysis of transition rates is based on data from the Integrated Employment Biographies (IEB) of the Institute for Employment Research. The IEB contains exact to the day information on individual employment biographies. It provides amongst others information on gender, school education and vocational training, occupation and occupational status as well as the employing establishment[11]. From the IEB we draw the individual employment history of each person employed in a STW or a matched non-STW establishment for at least one day after 1990. Our data range from January 1975 to December 2009[12]. Merging the short-time worker data with the IEB, we are able to identify individual episodes of short-time work. Furthermore we can distinguish short-time workers from non-short-time workers.

The combined data is then prepared for analysis. First, in case of parallel episodes, the main episode is kept: say a person holds a job and receives benefits at the same time. In this case the information on benefit recipience is discarded. Second, we identify transitions from employment to unemployment. A person is defined to become unemployed if an employment episode is followed by an unemployment episode within 31 days. Employees not subject to social security are not allowed to work short-time. We therefore discard the respective episodes. Since information on the receipt of STW compensation is only available on a monthly basis, the data is transformed to be exact to the month rather than exact to the day[13]. It is then possible to identify transitions from regular employment to STW. Since employees may enter and exit STW more than once (see section 3), we account for interruptions in the recipience of STW compensation of more than two months[14]. Finally, persons not allowed to work short-time due to legal reasons (e.g. apprentices and interns) are discarded from the analysis.

Finally, we construct some additional explanatory variables from our data. Since the education variable in the IEB exhibits a high share of missing values, we apply imputation procedure 2b of Fitzenberger/Osikominu/Voelter (2005) to the variable. The values of the imputed variable are then aggregated to three educational levels: low qualified individuals (without vocational training), qualified individuals (with vocational training) and high qualified individuals (holding a degree from a university or a university of applied sciences). The Blossfeld (1985) classification of occupations is applied to the occupation variable. The Blossfeld occupations are then further aggregated to low skilled, skilled and high skilled occupations[15]. Seniority is computed from the data as the number of years a person

[11] A detailed description of the IEB can be found in Oberschachtsiek et al. (2009).

[12] 2010 data on employment from the IEB was not yet available when the analysis was conducted.

[13] There may be more than one episode ending in the same month. In this case, the episode ending in unemployment is kept. If this does not apply, the episode with the longer duration is kept. Adjacent episodes referring to the same employer are then joined together.

[14] When an employer interrupts the STW program for two months or less, the granted period of STW compensation is prolonged by the duration of the interruption. This is not the case with interruptions of more than two months. Interruptions of two months or less are hence unlikely to reflect entrepreneurial strategy.

[15] Occupations classified as agricultural, simple manual, simple service or simple commercial and administrative occupations by Blossfeld are defined as low skilled occupations. Occupations classified as qualified manual, qualified service, qualified commercial and administrative occupations by Blossfeld are defined as skilled occupations. Finally, we define high skilled occupations as those classified as technicians, engineers, semiprofessions, professions or managers by Blossfeld.

has worked in the employing firm. Finally, we add characteristics of the employing firm using the Establishment History Panel of 2008.

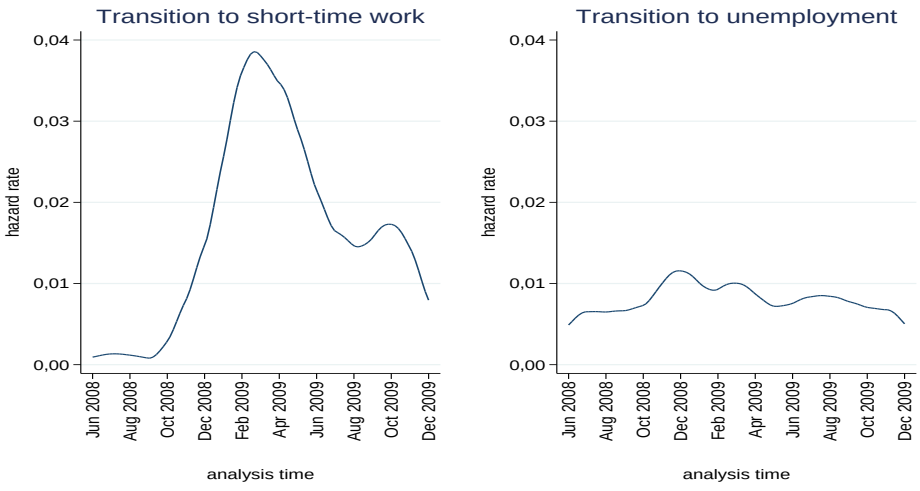
Our final data set consists of monthly multi-episode data ranging from May 2008 to December 2009. Only episodes of employment subject to social security are included. A person may exit regular employment several times (multiple failures), where the possible destination states are STW and unemployment. Individuals are defined to be at risk of STW or unemployment from May 2008 on[16]. Observational gaps may occur due to persons not being registered with the Federal Employment Agency for a certain period of time. The data is right censored, since at the time the analysis was conducted employment spells were only available up to the December 31st of 2009. We analyze 190.259 persons amongst which 40.149 exits into STW and 21.113 exits into unemployment occur. The summary statistics for the explanatory variables are given in table A.1 of the appendix.

6.2 Kaplan-Meier estimates

To our best knowledge hardly any empirical literature on the influence of the individual level of human capital on the risk of working short-time exists, which can probably be attributed to the lack of individual data on short-time workers. According to Koumakhov/Najman (2001), who study the problem of labor hoarding in Russia using the Russia Longitudinal Monitoring Survey, employees with firm-specific human capital are rather subject to administrative (compulsory) leaves, while unskilled workers are more likely to be employed under STW.

Figure 2 displays the overall hazard rate for the transition to STW and unemployment, respectively. The hazard rates are computed from survivor functions produced by the Kaplan-Meier estimator. The

Figure 2: Overall Hazard Rates



Source: Own calculations.

risk of working short-time sharply increases after October 2008 and peaks in March 2009. After that, the risk of STW quickly declines until August 2009. The fall of 2009 is marked by a slight re-rise of the hazard rate. Finally, 2008 levels are reached in December 2009.

While the hazard function for the transition to STW exhibits an almost bell-shaped form with two local maxima, the curve describing the risk of unemployment runs rather flat. Note that our analysis

[16] This is done to avoid the exclusion of observations which exit regular employment in June 2008, the first month in which we are able to observe exits to STW.

also includes employees of firms without a STW scheme but similar characteristics as STW-firms (see section 5). Nevertheless, the risk of unemployment is remarkably low compared to the risk of STW. Assuming that non-STW and STW firms are equally hit by the crisis, it appears the former employ other measures than lay-offs to adjust the volume of work. These measure may have included the reduction of hours accumulated in working time accounts (Burda/Hunt (2011)) and the less intensive use of agency workers (Dietz/Stops/Walwei (2011)); measures that we are not able to control for when matching STW and non-STW firms on the basis of the BHP. However, the observation of a low transition rate to unemployment – even when employees of non-STW establishments are taken into account – mirrors what is by now referred to as the German labor market miracle.

We also computed hazard functions for groups of employees distinguishing three skill levels of education and occupation, respectively. For the transition to STW hazard functions of the different groups intersect. This is one reason for the choice of the empirical model described in the following.

6.3 Regression Analysis

Modell

Transition rates to STW and unemployment are estimated by a piecewise constant model with period specific effects including ten two months intervals from May 2008 to January 2010. We choose this model for three reasons.

First, our descriptive analysis finds the hazard function for the transition to STW to be bell-shaped with two local maxima. Parametric models of time dependence are not suited to reproduce such a hazard function (Blossfeld/Golsch/Rohwer (2007)). Though these models would produce a bell-shaped hazard function, the single maximum would be estimated to occur considerably later than March 2009. This is caused by the second local maximum in fall of 2009, which distorts the estimated hazard function.

Second, one might consider estimating a standard Cox model, which assumes proportional hazards throughout the whole period of analysis. On the basis of the Schoenfeld residuals (Schoenfeld (1982)) we, however, find that this assumption does not apply in our case. Estimating a piecewise constant model with period specific effects, the hazards only need to be proportional within each period. This is true for most periods in our data.

Third, taking into account period specific effects, we are able to estimate intersecting hazard functions as obtained by the descriptive analysis. This approach allows us to account for the possibility that the risk of STW may at first be highest for one group, while this may apply for the other group in later months.

Intervals for the piecewise constant model are chosen as small as possible. Setting intervals to a length of one month only, results in the break down of the empirical model due to too many estimation coefficients. We therefore stick to intervals of two months length. The model to be estimated can be represented as

$$h(t) = \exp\left(\alpha_t + X_t\beta_t\right), \quad t = 1, ..., 10 \quad . \tag{1}$$

The hazard rate $h(t)$ is estimated via maximum likelihood for ten time intervals t of two months length. X_t represents the vector of covariates and β_t the associated vector of coefficients. Robust standard errors are obtained using the Huber/White estimator (Huber (1967), White (1980), White (1982)).

The explanatory variables included in the regression analysis control for individual as well as establishment characteristics. We incorporate three groups of variables reflecting the individual level

of human capital. The focus will be on seniority, since it is a measure for the extent of firm-specific knowledge, which is a crucial factor to employers. Formal human capital is reflected by the level of education as well as the skill level of occupation. We include the respective dummy variables, where the group of qualified employees and the group of employees holding a skilled occupation represent the respective reference category. According to our theoretical considerations presented in section 2, we expect seniority – the measure of firm-specific human capital – to be negatively related to the risk of STW. The same applies to our measures of formal human capital, education and occupation. In line with standard literature (Becker (1962), Nickell (1979)), the human capital variables are expected to decrease the risk of unemployment. Gender, age and nationality are incorporated in the analysis to control for potential discriminatory behavior of employers.

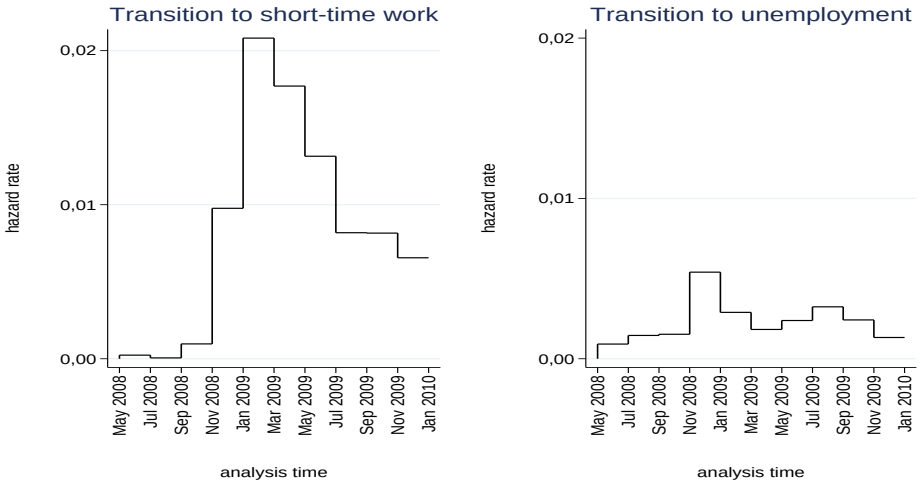
In order to take into account characteristics of the employing firm that may influence the transition to STW or unemployment, we include the following variables. Six branches of economic activity that extensively used STW during the analysis period (Statistic of the Federal Employment Agency (2011)) are controlled for. The year of foundation accounts for the fact that young companies may not be familiar with the instrument of STW thus being more reluctant to its use. Boeri/Bruecker (2011) actually use former experience with the scheme to instrument current demand for STW. Finally, we expect the individual risk of STW to rise with the size of the employing establishment, since we found larger firms more likely to implement a STW scheme in section 5. The size of the firm is therefore controlled for by the respective dummy variables, where small firms are the reference category[17].

Regression Results

Transition rates into short-time work

The regression results for the transition to STW are given in table A.2 of the appendix. The left panel of figure 3 displays the estimated transition rates. The hazard functions obtained from the piecewise constant model closely resemble those obtained from the Kaplan-Meier estimator. We first focus on

Figure 3: Transition Rates to Short-Time Work and Unemployment



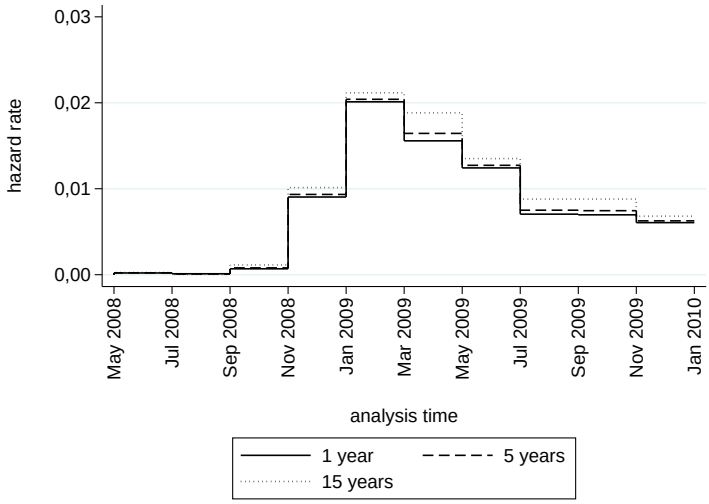
Source: Own calculations.

the regression results with respect to variables indicating the level of human capital. As a measure of

[17] Very small establishments have less than 10 workers, whereas small ones employ at least 10 but less than 50 workers. Establishments with at least 50 but less than 250 employees are referred to as medium sized. Large establishments have at least 250 employees.

firm-specific human capital, we estimate the effect of seniority on the risk of STW. Throughout the analysis period the effect is significant but very close to zero. To display this graphically the hazard functions for workers with 1 year, 5 years and 15 years of seniority are plotted in figure 4. For the three groups of employees, the risk of STW is basically the same. Thus, our analysis does not indicate a decisive role of firm-specific human capital on the risk of working short-time. Different results are

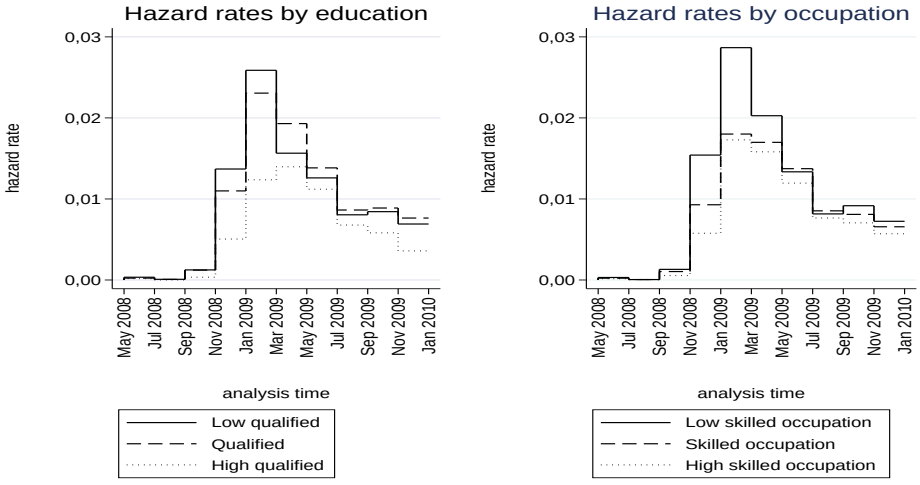
Figure 4: Transition Rates to Short-Time Work by Seniority



Source: Own calculations.

obtained with respect to education – a measure of formal human capital. The corresponding hazard functions are displayed in the left panel of figure 5. Throughout the entire analysis period high qualified

Figure 5: Transition Rates to STW by Education and Occupation



Source: Own calculations.

employees have the lowest risk of STW. Compared to qualified workers low qualified employees face an increased risk of working short-time until February 2009. In March 2009 hazard functions of low qualified and qualified workers then intersect, i.e. relative to qualified workers the low qualified have a reduced risk of STW in March and April 2009. Additionally, the differences in the hazard rates during the STW plateau period are rather small compared to the pronounced differences during the STW expansion period. We hence argue that there is no selective behavior of employers with respect

to education after March 2009.

This finding is sustained by our regression results on the skill level of occupation. Hazard functions are displayed in the right panel of figure 5. With the beginning of the STW plateau period in March 2009 the hazard rate of workers with a low skilled occupation approaches the rates of the remaining two groups. Again, workers pursuing a high skilled occupation exhibit a reduced risk of working short-time in all months.

Based on our theoretical analysis in section 2, we expected a negative relation between the individual level of human capital and the risk of working short-time. However, the obtained regression results do not confirm this hypothesis. We do not find selective behavior of employers with respect to firm-specific human capital. Selection with respect to formal human capital is only observed during the STW expansion period. During the STW plateau period the empirical results indicate similar transition rates to STW across employees. In the months after March 2009 – when STW was extensively used – we thus cannot speak of firms selecting employees into STW according to the level of human capital.

Two reasons may explain why employers' behavior does not correspond to our predictions. First, Burda/Hunt (2011) argue that employers may have expected the recession to be short. They investigate this hypothesis using indices of current business situation and business expectations for the next 6 months from the Ifo Institute for Economic Research. They indeed find employers not surprised by the end of the 2008-09 recession. Unfortunately, with data only reaching 6 months into the future, the authors are not able to draw conclusions about firms' expectations at the start of the recession. Employers expecting the lack of work to end soon, may have been prone to apply the instrument of STW to all groups of employees irrespective of their level of human capital.

Furthermore, employers' behavior may have partly been guided by fairness considerations. A whole strand of literature deals with the importance of justice in organizations. While theoretical work in this field is ample (a comprehensive survey is provided by Greenberg (1987) and Greenberg (1990)), the essence is the view of "organizations as arenas for long-term, mutual social transactions between the employees and the organization" (Cohen-Charash/Spector (2001), p. 285). Theoretical models of organizational justice postulate a positive relation between perceived justice and employees' work performance. Moreover, so called withdrawal behavior – the reduction of work effort in response to perceived injustice – , is predicted (Cohen-Charash/Spector (2001), Colquitt et al. (2001)). Empirical studies mostly distinguish between distributive, procedural, and interactional justice[18]. In a meta-analysis of 190 studies samples totaling 64.757 participants Cohen-Charash/Spector (2001) find procedural justice to positively influence work performance. In comparison, the effect of distributive justice is relatively small. Additionally, the authors find a negative relation between counterproductive work behavior and both distributive and procedural justice. Colquitt et al. (2001) obtain similar results in their meta-analysis. A more recent study by Tortia (2008) confirms that workers well-being strongly rises with perceived justice, which is in turn likely to increase work performance. Employers hence have good reasons to ensure that their behavior is perceived as fair. It is not hard to imagine that workers would not consider it fair to only select certain individuals into STW. Employers' fairness considerations may thus provide a second explanation for similar transition rates into STW.

[18]While distributive justice refers to perceived justice with respect to outcomes, procedural justice is concerned with the justice of a decision process leading to certain outcomes. Interactional justice rather focuses on justice of interpersonal behavior (Cohen-Charash/Spector (2001)).

So far, our analysis did not find selective behavior of employers with respect to the level of human capital. The inclusion of gender, age and nationality in our empirical model also enables us to account for potential discriminatory behavior of firms. Except for the first four month of the analysis time men face a higher risk of working short-time than women, although the differences in the hazard rates are not too pronounced (see figure A.1 of the appendix). This can be ascribed to men being more likely to hold an occupational status which is rather subject to a lack of work (such as blue-collar jobs). Due to strong correlation with the dummy variables reflecting the skill level of occupation, we were not able to include occupational status in our regression analysis. This variable differentiates amongst others between skilled workers and white-collar employees.

With respect to age we do not find an influence on the transition rate from regular employment to STW. The estimated effect is significant but close to zero, meaning that firms do not select employees into STW with respect to age. Furthermore, we do not observe selective behavior of employers with respect to nationality. Although estimates are significant for the months between September 2008 and October 2009 the sign of the estimation coefficient changes and differences in the hazard rates are not very pronounced.

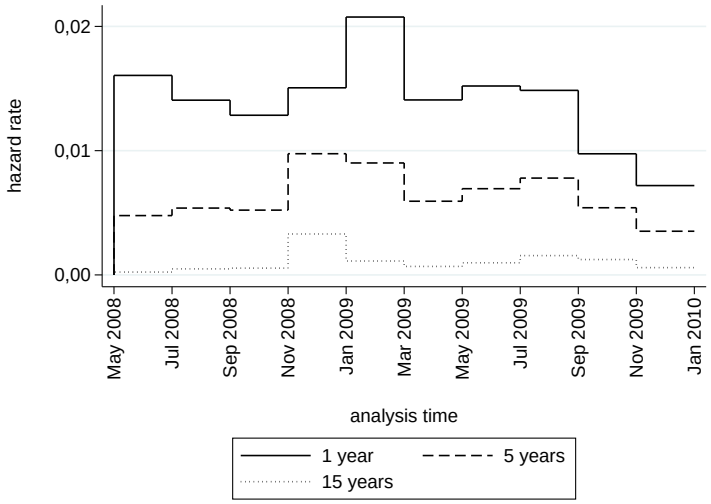
As further controls we included establishment characteristics in our model. Not surprisingly, being employed in manufacturing, construction or transport – the branches of economic activity hardest hit by the 2008-09 recession – increases the risk of working short-time distinctly. The establishment's age does not seem to play a decisive role in determining individual transition rates to STW.

Transition rates to unemployment

In a separate regression, we estimate the transition rate from regular employment to unemployment. The results are presented in table A.3 of the appendix.

Differences in the respective hazard rates show a negative relation between the level of individual human capital and the risk of unemployment. Figure 6 plots the transition rates to unemployment for three different levels of seniority. Not surprisingly, little firm-specific work experience strongly

Figure 6: Transition Rates to Unemployment by Seniority



Source: Own calculations.

increases the risk of unemployment. In contrast to the risk of STW, the effect of seniority on the risk of unemployment is rather strong. These findings are sustained by the results on the variables measuring formal human capital. Throughout the entire analysis period, the risk of unemployment is

highest for low qualified workers. With respect to occupations the picture is even more pronounced. Compared to employees with a skilled or high skilled occupation, a low skilled occupation increases the risk of being laid-off considerably.

With respect to gender, age and nationality no systematic discriminatory behavior of employers is observed. As with STW, differences in the transition rates to unemployment of men and women are negligible (see figure A.2 of the appendix).

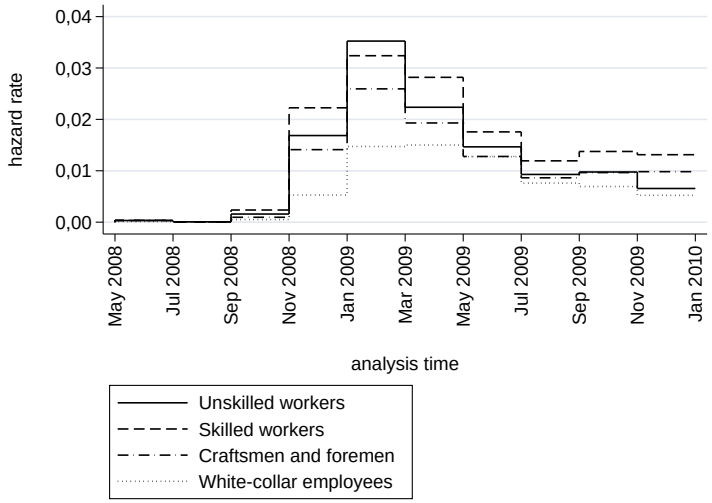
In summary, our results indicate that individuals with a low level of human capital are selected to be laid-off. This results is not surprising and in line with standard human capital theory (Becker (1962), Nickell (1979)). In contrast, individual transitions to STW are not coined by selective behavior of employers. As possible reasons we name employers expectations and fairness considerations.

6.4 Robustness Checks

We conduct two robustness checks. First, we control for the occupational status instead of the skill level of occupation. Second, we exclude employees of non-STW establishments from the analysis.

In our empirical model, we use three measures of human capital: seniority, the level of education and the skill level of occupation. We were not able to include occupational status due to the strong correlation with the skill level of occupation. In order to check the robustness of our results, we re-estimate the model, where the skill level of occupation is replaced by the occupational status. Figure 7 shows that our previous findings are sustained. White-collar employees are exposed to the lowest risk

Figure 7: Transition rate to STW by Occupational Status



Source: Own calculations.

of working-short time. With the beginning of the STW plateau period in March of 2009 the hazard rates of the other groups approach the hazard rate of white-collar employees, so that we cannot speak of selective behavior during the STW plateau period.

As explained in section 5 our risk pool consists of employees of STW-establishments as well as workers of non-STW establishments, which may have opted to implement a STW scheme. The inclusion of employees of certain non-STW establishments might, however, distort our results. In order to rule out this possibility, we perform our analysis only taking into account workers of STW-establishments. The results are presented in table A.4 of the appendix. By definition, the estimated transition rates are higher than the rates obtained in section 6.3, since the risk pool – the basis to calculate the transition

rate – is now smaller. As the same absolute number of transitions occurs in each period, the shape of the overall hazard function does not differ to the one displayed in the left panel of figure 3. With respect to the individual characteristics included in the regression, very similarly shaped hazard functions are obtained. We therefore conclude that our results are not distorted by the inclusion of employees of non-STW establishments into the risk pool.

7 Conclusion

In this paper we analyze the individual risk of short-time work (STW) between May 2008 and December 2009. As a competing risk, transitions to unemployment are taken into account. We ask whether employees' characteristics determine the risk of working short-time, where special focus is given to the individual level of human capital. From a theoretical point of view establishments face incentives to select low skilled individuals for STW. This behavior may be explained by the cost of STW positively depending on the wage rate, which is in turn determined by the individual level of human capital.

The results are based on a unique data set of short-time workers located in the district of the employment agency of Nuremberg. This data is combined with process data of the Institute for Employment Research. Based on the development of STW in Nuremberg, which closely resembles the usage in Germany as a whole, we differentiate between two periods, the STW expansion period and the STW plateau period.

Our empirical strategy follows a two-stage approach. In the first stage, we use methods of propensity score matching to identify establishments which did not implement a STW scheme but are similar to STW establishments. We argue that non-STW establishments which closely resemble firms with a STW scheme were equally affected by the 2008-09 recession. They were therefore provided with the possibility to conduct STW putting their employees at risk. In order to analyze transitions to STW, the risk pool needs to comprise employees of establishments which actually opted for STW as well as employees of establishments which may have done so. This approach also facilitates the consideration of unemployment as a competing risk, since German jurisdiction rules out lay-offs during periods of STW. In the second stage of our analysis we estimate a piecewise constant model with period specific effects to determine the relation between individual characteristics and the risk of working short-time. A separate regression estimates the effects on the risk of unemployment.

The results do not indicate that employers select short-time workers according to their level of human capital. Surprisingly, there is almost no influence of seniority, our measure of firm-specific human capital, on the risk of working short-time. The level of education as well as the skill level of occupation are used to reflect formal human capital. During the STW plateau period differences in the respective transition rates are rather small. An increased risk of STW for employees with a low degree of formal human capital can only be observed during the STW expansion period. We conduct several robustness checks, which sustain these findings.

Non-selective behavior of employers may be explained by the expectation of a near end of the recession (Burda/Hunt (2011)). In this case, employers may have been willing to apply STW to all groups of employees. As a further reason we name fairness considerations. Among employees the selection of certain individuals into STW may be perceived as unfair, which is likely to lead to counterproductive behavior (Cohen-Charash/Spector (2001), Colquitt et al. (2001)).

The overall risk of unemployment is rather small compared to the risk of STW. In line with standard literature, a low level of human capital is associated with an augmented risk of unemployment.

Strictly speaking, the validity of the results presented in this paper is limited to the district of the employment agency of Nuremberg. However, the development of STW in Nuremberg as well as the structure of the STW establishments are similar to the whole of Germany. This leads us to believe, that the findings are not caused by properties particular to the Nuremberg area.

This paper provides insight on the determinants of individual entries to short-time work. The analysis on exits from short-time work and the potential effects on the subsequent employment biography is left for future work.

A Appendix

Table A.1: Summary Statistics

Variable	**Mean**	**Std. Dev.**
Seniority	9.301	8.510
Low qualified	0.153	0.360
Qualified	0.675	0.468
High qualified	0.157	0.363
Low skilled occupation	0.395	0.489
Skilled occupation	0.395	0.489
High skilled occupation	0.210	0.407
Female	0.357	0.479
Age	40.510	11.231
Non-German	0.119	0.324
Manufacturing	0.475	0.499
Construction	0.026	0.159
Wholesale, retail; repair of motor vehicles and goods	0.075	0.263
Transport, storage, communication	0.036	0.187
Real estate, renting and business activities	0.242	0.428
Year of foundation	1984.781	11.770
Very small firm	0.050	0.219
Small firm	0.139	0.346
Medium sized firm	0.283	0.450
Large firm	0.528	0.499
Other service activities	0.005	0.074

Note: 242535 observations ; 190259 persons

Table A.2: Piecewise Constant Regression with Period Specific Effects

Transition rate from regular employment to short-time work		
t1: May, Jun 08	96,2661***	(7,60)
t2: Jul, Aug 08	-220,3178***	(-11,60)
t3: Sep, Oct 08	57,3193***	(9,05)
t4: Nov, Dec 08	32,9974***	(11,40)
t5: Jan, Feb 09	-7,5399***	(-4,20)
t6: Mar, Apr 09	-28,3248***	(-13,80)
t7: May, Jun 09	-38,0381***	(-13,21)
t8: Jul, Aug 09	-48,6524***	(-14,99)
t9: Sep, Oct 09	-80,5561***	(-28,55)
t10: Nov, Dec 09	-40,9055***	(-7,26)
Seniority t1	0,0157**	(2,84)
Seniority t2	-0,0690**	(-3,20)
Seniority t3	0,0358***	(12,07)
Seniority t4	0,0082***	(4,59)
Seniority t5	0,0036**	(2,81)
Seniority t6	0,0136***	(8,66)
Seniority t7	0,0060**	(2,71)
Seniority t8	0,0158***	(6,58)
Seniority t9	0,0167***	(7,59)
Seniority t10	0,0083	(1,84)
Low qualified t1	0,3707**	(2,77)
Low qualified t2	0,1554	(1,03)
Low qualified t3	0,0207	(0,30)
Low qualified t4	0,2195***	(6,14)
Low qualified t5	0,1152***	(4,53)
Low qualified t6	-0,2099***	(-5,87)
Low qualified t7	-0,0935	(-1,91)
Low qualified t8	-0,0709	(-1,30)
Low qualified t9	-0,0519	(-1,15)
Low qualified t10	-0,1011	(-1,16)
High qualified t1	-0,2581	(-0,86)
High qualified t2	-1,5948***	(-4,59)
High qualified t3	-1,2755***	(-7,14)
High qualified t4	-0,7780***	(-12,06)
High qualified t5	-0,6230***	(-15,15)
High qualified t6	-0,3230***	(-8,50)
High qualified t7	-0,2115***	(-3,99)
High qualified t8	-0,2419***	(-4,07)
High qualified t9	-0,4221***	(-7,44)
High qualified t10	-0,7537***	(-6,48)

Table A.2: (continued)

Low skilled occupation t1	0,3129**	(2,88)
Low skilled occupation t2	0,0010	(0,01)
Low skilled occupation t3	0,2289***	(3,85)
Low skilled occupation t4	0,5068***	(16,00)
Low skilled occupation t5	0,4650***	(21,84)
Low skilled occupation t6	0,1768***	(7,29)
Low skilled occupation t7	-0,0287	(-0,84)
Low skilled occupation t8	-0,0455	(-1,16)
Low skilled occupation t9	0,1243***	(3,69)
Low skilled occupation t10	0,0979	(1,48)
High skilled occupation t1	-0,2996	(-1,31)
High skilled occupation t2	0,0722	(0,36)
High skilled occupation t3	-0,6319***	(-5,69)
High skilled occupation t4	-0,4769***	(-8,59)
High skilled occupation t5	-0,0406	(-1,25)
High skilled occupation t6	-0,0712*	(-2,16)
High skilled occupation t7	-0,1391**	(-2,92)
High skilled occupation t8	-0,1091*	(-2,06)
High skilled occupation t9	-0,1376**	(-2,82)
High skilled occupation t10	-0,1402	(-1,48)
Female t1	0,4321***	(4,12)
Female t2	0,4785***	(3,71)
Female t3	-0,2443***	(-4,15)
Female t4	-0,4859***	(-14,90)
Female t5	-0,1772***	(-8,44)
Female t6	-0,2507***	(-10,06)
Female t7	-0,0843*	(-2,51)
Female t8	-0,2763***	(-6,91)
Female t9	-0,2763***	(-7,79)
Female t10	-0,2953***	(-4,53)
Age t1	0,0141*	(2,57)
Age t2	0,0220***	(4,01)
Age t3	-0,0190***	(-6,70)
Age t4	-0,0040**	(-2,74)
Age t5	-0,0044***	(-4,49)
Age t6	-0,0122***	(-10,70)
Age t7	-0,0026	(-1,70)
Age t8	-0,0067***	(-3,70)
Age t9	-0,0049**	(-3,16)
Age t10	-0,0086**	(-2,69)
Non-German t1	0,0721	(0,39)
Non-German t2	0,0389	(0,25)

Table A.2: (continued)

Non-German t3	0,6478***	(9,64)
Non-German t4	0,3392***	(9,05)
Non-German t5	0,3079***	(11,60)
Non-German t6	-0,0968*	(-2,48)
Non-German t7	0,1064*	(2,10)
Non-German t8	0,1662**	(3,00)
Non-German t9	-0,2965***	(-5,43)
Non-German t10	-0,1048	(-1,07)
Manufacturing t1	1,7505***	(3,96)
Manufacturing t2	1,6583**	(3,11)
Manufacturing t3	5,0840***	(7,17)
Manufacturing t4	2,2614***	(21,02)
Manufacturing t5	3,0533***	(32,39)
Manufacturing t6	3,7708***	(25,37)
Manufacturing t7	1,9981***	(20,10)
Manufacturing t8	3,1487***	(16,93)
Manufacturing t9	3,4205***	(18,48)
Manufacturing t10	1,7911***	(9,35)
Construction t1	1,6543***	(3,47)
Construction t2	1,1445	(1,53)
Construction t3	3,7026***	(4,84)
Construction t4	1,8033***	(11,38)
Construction t5	1,7957***	(13,75)
Construction t6	1,6040***	(7,80)
Construction t7	0,2797	(1,60)
Construction t8	1,5971***	(6,56)
Construction t9	2,1602***	(9,72)
Construction t10	0,7587**	(2,60)
Wholesale, retail; repair of motor vehicles and goods t1	0,8923	(1,89)
Wholesale, retail; repair of motor vehicles and goods t2	-0,3023	(-0,38)
Wholesale, retail; repair of motor vehicles and goods t3	3,5415***	(4,85)
Wholesale, retail; repair of motor vehicles and goods t4	1,4681***	(11,49)
Wholesale, retail; repair of motor vehicles and goods t5	2,1592***	(20,94)
Wholesale, retail; repair of motor vehicles and goods t6	3,2488***	(21,11)
Wholesale, retail; repair of motor vehicles and goods t7	1,2741***	(11,12)

Table A.2: (continued)

Wholesale, retail; repair of motor vehicles and goods t8	2,8071***	(14,29)
Wholesale, retail; repair of motor vehicles and goods t9	2,2975***	(11,46)
Wholesale, retail; repair of motor vehicles and goods t10	0,8457***	(3,59)
Transport, storage, communication t1	-0,0636	(-0,10)
Transport, storage, communication t2	-14,9842***	(-27,80)
Transport, storage, communication t3	4,3147***	(5,94)
Transport, storage, communication t4	1,2422***	(8,78)
Transport, storage, communication t5	1,8839***	(16,89)
Transport, storage, communication t6	2,5434***	(15,34)
Transport, storage, communication t7	1,6203***	(13,88)
Transport, storage, communication t8	1,7308***	(7,71)
Transport, storage, communication t9	1,6357***	(7,43)
Transport, storage, communication t10	0,6007*	(2,22)
Real estate, renting and business activities t1	-0,6075	(-1,04)
Real estate, renting and business activities t2	-0,5368	(-0,89)
Real estate, renting and business activities t3	2,7076***	(3,73)
Real estate, renting and business activities t4	1,3121***	(11,31)
Real estate, renting and business activities t5	1,1582***	(11,30)
Real estate, renting and business activities t6	2,4252***	(15,94)
Real estate, renting and business activities t7	0,9752***	(9,20)
Real estate, renting and business activities t8	2,1944***	(11,50)
Real estate, renting and business activities t9	2,0909***	(11,02)
Real estate, renting and business activities t10	1,3243***	(6,68)
Other service activities t1	0,9498	(1,31)
Other service activities t2	-14,1731***	(-25,72)
Other service activities t3	-13,2867***	(-18,64)
Other service activities t4	-0,5470	(-0,93)
Other service activities t5	0,5939	(1,88)
Other service activities t6	0,7217	(1,53)

Table A.2: (continued)

Other service activities t7	0,5981*	(2,10)
Other service activities t8	0,1188	(0,16)
Other service activities t9	-16,2279***	(-85,13)
Other service activities t10	2,3475***	(8,12)
Year of foundation t1	-0,0525***	(-8,26)
Year of foundation t2	0,1061***	(11,04)
Year of foundation t3	-0,0337***	(-10,47)
Year of foundation t4	-0,0198***	(-13,47)
Year of foundation t5	0,0010	(1,07)
Year of foundation t6	0,0112***	(10,76)
Year of foundation t7	0,0166***	(11,39)
Year of foundation t8	0,0212***	(12,95)
Year of foundation t9	0,0373***	(26,13)
Year of foundation t10	0,0178***	(6,24)
Very small firm t1	0,6395***	(4,92)
Very small firm t2	-0,4014	(-1,11)
Very small firm t3	-0,2647	(-1,48)
Very small firm t4	-0,2472*	(-2,29)
Very small firm t5	-0,2445***	(-4,30)
Very small firm t6	-0,0551	(-0,97)
Very small firm t7	-0,0701	(-1,02)
Very small firm t8	0,0095	(0,12)
Very small firm t9	-0,2341**	(-2,93)
Very small firm t10	0,0005	(0,00)
Medium sized firm t1	-1,6188***	(-11,75)
Medium sized firm t2	-2,5308***	(-5,33)
Medium sized firm t3	-0,3898***	(-4,26)
Medium sized firm t4	0,3538***	(6,52)
Medium sized firm t5	-0,0601*	(-2,06)
Medium sized firm t6	0,1679***	(5,17)
Medium sized firm t7	-0,1225**	(-2,90)
Medium sized firm t8	-0,0928	(-1,86)
Medium sized firm t9	-0,1969***	(-4,17)
Medium sized firm t10	0,0991	(1,13)
Large firm t1	-3,0846***	(-15,20)
Large firm t2	1,0635***	(5,27)
Large firm t3	0,1220	(1,60)
Large firm t4	0,5248***	(10,23)
Large firm t5	-0,0728**	(-2,67)
Large firm t6	-0,1560***	(-4,81)
Large firm t7	-0,5961***	(-13,62)
Large firm t8	-0,3560***	(-7,13)

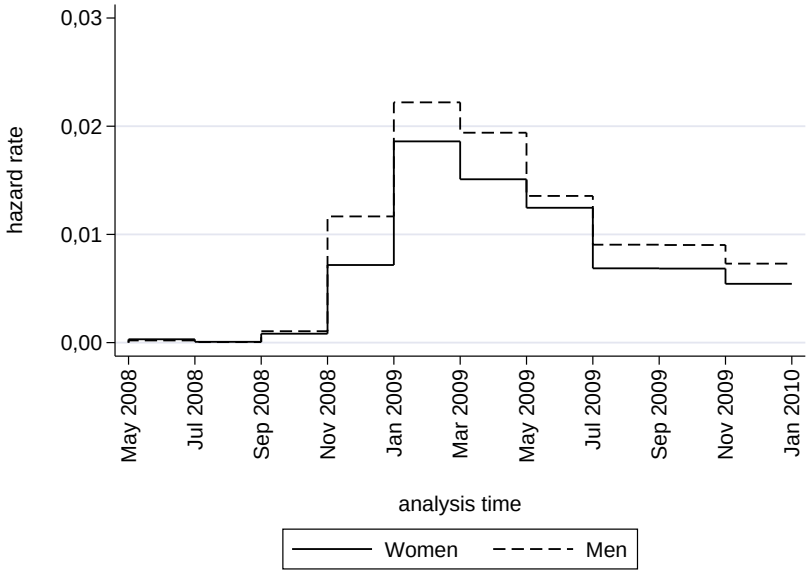
Table A.2: (continued)

Large firm t9	-0,0861	(-1,94)
Large firm t10	-0,2410**	(-2,73)
Observations	1.419.627	
Number of subjects	190.253	
Number of events	40.149	
Wald Chi^2	2.072.976,33	
Prob $> Chi^2$	0,0000	

z statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure A.1: Transition Rates to STW by Gender



Source: Own calculations.

Table A.3: Piecewise Constant Regression with Period Specific Effects

Transition rate from regular employment to unemployment		
t1: May, Jun 08	3,4799	(0,89)
t2: Jul, Aug 08	-4,3478	(-1,08)
t3: Sep, Oct 08	-18,3082***	(-5,14)
t4: Nov, Dec 08	-6,0620*	(-1,96)
t5: Jan, Feb 09	-10,6946**	(-3,21)
t6: Mar, Apr 09	-9,9616*	(-2,40)
t7: May, Jun 09	-8,7839*	(-2,14)
t8: Jul, Aug 09	-24,5519***	(-5,94)
t9: Sep, Oct 09	-1,1967	(-0,28)
t10: Nov, Dec 09	20,5549***	(4,21)
Seniority t1	-0,3032***	(-18,85)
Seniority t2	-0,2402***	(-18,24)
Seniority t3	-0,2255***	(-18,85)
Seniority t4	-0,1086***	(-18,36)
Seniority t5	-0,2086***	(-22,42)
Seniority t6	-0,2162***	(-17,72)
Seniority t7	-0,1961***	(-18,94)
Seniority t8	-0,1612***	(-17,77)
Seniority t9	-0,1474***	(-15,52)
Seniority t10	-0,1789***	(-12,05)
Low qualified t1	0,1624**	(2,86)
Low qualified t2	0,3234***	(5,77)
Low qualified t3	0,2355***	(4,66)
Low qualified t4	0,1946***	(4,36)
Low qualified t5	0,0458	(0,88)
Low qualified t6	0,0614	(0,96)
Low qualified t7	0,3329***	(5,91)
Low qualified t8	0,1531*	(2,55)
Low qualified t9	0,1976**	(3,14)
Low qualified t10	0,3062***	(3,83)
High qualified t1	-0,6361***	(-7,04)
High qualified t2	-0,5967***	(-7,15)
High qualified t3	-0,8271***	(-8,84)
High qualified t4	-0,6869***	(-10,17)
High qualified t5	-0,6459***	(-9,58)
High qualified t6	-0,6039***	(-7,43)
High qualified t7	-0,3382***	(-4,49)
High qualified t8	-0,4886***	(-6,56)
High qualified t9	-0,7295***	(-7,97)
High qualified t10	-1,8112***	(-7,42)

Table A.3: (continued)

Low skilled occupation t1	0,7790***	(14,79)
Low skilled occupation t2	0,6793***	(12,79)
Low skilled occupation t3	0,9938***	(20,24)
Low skilled occupation t4	0,9147***	(22,39)
Low skilled occupation t5	0,5620***	(12,97)
Low skilled occupation t6	0,6441***	(12,14)
Low skilled occupation t7	0,8490***	(16,46)
Low skilled occupation t8	0,5512***	(10,92)
Low skilled occupation t9	0,6869***	(12,33)
Low skilled occupation t10	1,1001***	(13,87)
High skilled occupation t1	-0,4536***	(-5,05)
High skilled occupation t2	-0,2992***	(-3,69)
High skilled occupation t3	-0,4587***	(-5,14)
High skilled occupation t4	-0,3586***	(-5,39)
High skilled occupation t5	-0,4518***	(-6,73)
High skilled occupation t6	-0,3473***	(-4,36)
High skilled occupation t7	-0,4501***	(-5,67)
High skilled occupation t8	-0,2279***	(-3,29)
High skilled occupation t9	-0,4527***	(-5,21)
High skilled occupation t10	-1,0655***	(-5,43)
Female t1	0,0659	(1,40)
Female t2	-0,0713	(-1,47)
Female t3	-0,2594***	(-5,71)
Female t4	-0,2853***	(-7,35)
Female t5	-0,3256***	(-7,73)
Female t6	-0,2144***	(-4,24)
Female t7	-0,1601***	(-3,47)
Female t8	-0,1370**	(-2,90)
Female t9	-0,3579***	(-6,57)
Female t10	-0,2126**	(-3,00)
Age t1	0,0027	(1,29)
Age t2	0,0001	(0,04)
Age t3	-0,0002	(-0,09)
Age t4	0,0005	(0,26)
Age t5	0,0073***	(3,90)
Age t6	0,0072**	(3,22)
Age t7	0,0094***	(4,47)
Age t8	0,0032	(1,49)
Age t9	0,0055*	(2,27)
Age t10	0,0158***	(5,11)
Non-German t1	0,1204*	(1,98)
Non-German t2	0,2426***	(4,08)

Table A.3: (continued)

Non-German t3	0,0872	(1,55)
Non-German t4	0,3508***	(7,54)
Non-German t5	0,3621***	(6,93)
Non-German t6	0,1607*	(2,35)
Non-German t7	0,0176	(0,27)
Non-German t8	0,1454*	(2,28)
Non-German t9	0,1523*	(2,17)
Non-German t10	0,0738	(0,80)
Manufacturing t1	-0,1287	(-1,18)
Manufacturing t2	0,2410*	(2,17)
Manufacturing t3	0,2785*	(2,38)
Manufacturing t4	0,3455***	(3,72)
Manufacturing t5	0,7963***	(7,66)
Manufacturing t6	0,3738***	(3,30)
Manufacturing t7	-0,7122***	(-9,92)
Manufacturing t8	-0,4864***	(-5,98)
Manufacturing t9	-0,1493	(-1,37)
Manufacturing t10	0,5861**	(3,14)
Construction t1	0,5602***	(3,67)
Construction t2	0,6433***	(3,92)
Construction t3	1,1367***	(7,82)
Construction t4	1,7188***	(15,42)
Construction t5	1,3103***	(9,09)
Construction t6	0,5147**	(2,88)
Construction t7	-0,4500**	(-3,13)
Construction t8	-0,4383**	(-2,88)
Construction t9	0,7328***	(5,13)
Construction t10	1,8981***	(8,64)
Wholesale, retail; repair of motor vehicles and goods t1	-0,1457	(-1,09)
Wholesale, retail; repair of motor vehicles and goods t2	0,0924	(0,66)
Wholesale, retail; repair of motor vehicles and goods t3	0,1522	(1,08)
Wholesale, retail; repair of motor vehicles and goods t4	0,1428	(1,23)
Wholesale, retail; repair of motor vehicles and goods t5	0,2767*	(2,08)
Wholesale, retail; repair of motor vehicles and goods t6	0,2914*	(2,10)
Wholesale, retail; repair of motor vehicles and goods t7	-0,8830***	(-8,11)

Table A.3: (continued)

Wholesale, retail; repair of motor vehicles and goods t8	-0,6434***	(-5,54)
Wholesale, retail; repair of motor vehicles and goods t9	-0,2284	(-1,61)
Wholesale, retail; repair of motor vehicles and goods t10	-0,0400	(-0,17)
Transport, storage, communication t1	-0,2981	(-1,78)
Transport, storage, communication t2	-0,0579	(-0,34)
Transport, storage, communication t3	-0,0031	(-0,02)
Transport, storage, communication t4	-0,2283	(-1,58)
Transport, storage, communication t5	0,5858***	(4,18)
Transport, storage, communication t6	0,0667	(0,39)
Transport, storage, communication t7	-1,1461***	(-7,85)
Transport, storage, communication t8	-0,7099***	(-4,94)
Transport, storage, communication t9	-0,5101**	(-2,88)
Transport, storage, communication t10	-1,1739**	(-2,96)
Real estate, renting and business activities t1	0,8400***	(7,69)
Real estate, renting and business activities t2	1,1098***	(10,26)
Real estate, renting and business activities t3	1,2477***	(11,04)
Real estate, renting and business activities t4	1,3250***	(14,73)
Real estate, renting and business activities t5	1,5021***	(14,52)
Real estate, renting and business activities t6	1,3618***	(12,27)
Real estate, renting and business activities t7	0,1445*	(2,12)
Real estate, renting and business activities t8	0,2003*	(2,45)
Real estate, renting and business activities t9	0,9238***	(8,77)
Real estate, renting and business activities t10	1,4254***	(8,45)
Other service activities t1	0,5223*	(1,98)
Other service activities t2	0,4049	(1,27)
Other service activities t3	0,8571**	(3,28)
Other service activities t4	0,2870	(1,09)
Other service activities t5	0,9770***	(3,75)
Other service activities t6	-0,1041	(-0,25)

Table A.3: (continued)

Other service activities t7	-0,5443	(-1,92)
Other service activities t8	-0,3451	(-1,26)
Other service activities t9	0,4355	(1,64)
Other service activities t10	0,7097	(1,59)
Year of foundation t1	-0,0038	(-1,91)
Year of foundation t2	0,0001	(0,03)
Year of foundation t3	0,0070***	(3,90)
Year of foundation t4	0,0008	(0,52)
Year of foundation t5	0,0031	(1,83)
Year of foundation t6	0,0027	(1,31)
Year of foundation t7	0,0025	(1,20)
Year of foundation t8	0,0105***	(5,04)
Year of foundation t9	-0,0017	(-0,77)
Year of foundation t10	-0,0133***	(-5,37)
Very small firm t1	0,3580***	(3,69)
Very small firm t2	0,1146	(1,16)
Very small firm t3	0,3146***	(3,63)
Very small firm t4	0,3966***	(5,71)
Very small firm t5	0,2371**	(2,76)
Very small firm t6	0,1046	(1,03)
Very small firm t7	0,2037	(1,96)
Very small firm t8	0,2125*	(2,12)
Very small firm t9	0,5149***	(5,26)
Very small firm t10	0,9207***	(6,72)
Medium sized firm t1	0,1587*	(2,46)
Medium sized firm t2	-0,1886**	(-2,93)
Medium sized firm t3	-0,0190	(-0,32)
Medium sized firm t4	-0,1429**	(-2,84)
Medium sized firm t5	0,0767	(1,33)
Medium sized firm t6	0,0136	(0,21)
Medium sized firm t7	0,2478***	(3,73)
Medium sized firm t8	0,2758***	(4,19)
Medium sized firm t9	0,1538*	(2,13)
Medium sized firm t10	0,2228*	(1,99)
Large firm t1	-0,3843***	(-5,36)
Large firm t2	-0,3479***	(-5,05)
Large firm t3	-0,2345***	(-3,61)
Large firm t4	-0,2706***	(-5,12)
Large firm t5	-0,0807	(-1,33)
Large firm t6	-0,5210***	(-7,03)
Large firm t7	-0,4707***	(-6,05)
Large firm t8	-0,3940***	(-5,26)

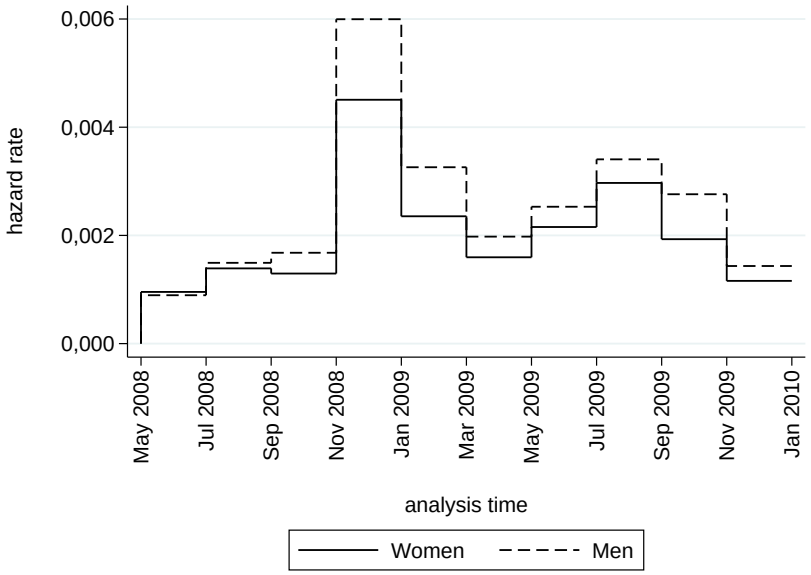
Table A.3: (continued)

Large firm t9	-0,4883***	(-6,01)
Large firm t10	-0,0545	(-0,47)
Observations	1.419.627	
Number of subjects	190.253	
Number of events	21.113	
Wald Chi^2	294.159,76	
Prob $> Chi^2$	0,0000	

z statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure A.2: Transition Rates to Unemployment by Gender



Source: Own calculations.

Table A.4: Piecewise Constant Regression with Period Specific Effects

Transition rate from regular employment to STW (only employees of STW establishments)		
t1: May, Jun 08	107,8521***	(8,19)
t2: Jul, Aug 08	-194,6312***	(-11,44)
t3: Sep, Oct 08	66,6178***	(10,81)
t4: Nov, Dec 08	49,4513***	(16,97)
t5: Jan, Feb 09	7,7130***	(4,50)
t6: Mar, Apr 09	-13,8098***	(-7,08)
t7: May, Jun 09	-20,2466***	(-7,30)
t8: Jul, Aug 09	-34,6415***	(-10,80)
t9: Sep, Oct 09	-64,6002***	(-23,47)
t10: Nov, Dec 09	-17,7894**	(-3,12)
Seniority t1	0,0162**	(3,01)
Seniority t2	-0,0733***	(-3,70)
Seniority t3	0,0327***	(10,93)
Seniority t4	0,0059***	(3,39)
Seniority t5	-0,0003	(-0,23)
Seniority t6	0,0114***	(7,69)
Seniority t7	0,0053*	(2,54)
Seniority t8	0,0146***	(6,20)
Seniority t9	0,0141***	(6,59)
Seniority t10	0,0071	(1,60)
Low qualified t1	0,2654	(1,94)
Low qualified t2	0,1486	(0,97)
Low qualified t3	0,0118	(0,16)
Low qualified t4	0,2180***	(6,05)
Low qualified t5	0,1073***	(4,32)
Low qualified t6	-0,1955***	(-5,59)
Low qualified t7	-0,1166*	(-2,41)
Low qualified t8	-0,0860	(-1,57)
Low qualified t9	-0,0583	(-1,27)
Low qualified t10	-0,1270	(-1,46)
High qualified t1	-0,2219	(-0,75)
High qualified t2	-1,3760***	(-3,99)
High qualified t3	-1,1229***	(-6,22)
High qualified t4	-0,5829***	(-8,92)
High qualified t5	-0,5146***	(-12,58)
High qualified t6	-0,2433***	(-6,47)
High qualified t7	-0,1348**	(-2,60)
High qualified t8	-0,1288*	(-2,18)
High qualified t9	-0,3036***	(-5,36)
High qualified t10	-0,6422***	(-5,55)

Table A.4: (continued)

Low skilled occupation t1	0,4298***	(3,77)
Low skilled occupation t2	-0,0065	(-0,05)
Low skilled occupation t3	0,1616**	(2,64)
Low skilled occupation t4	0,4108***	(12,86)
Low skilled occupation t5	0,4395***	(20,93)
Low skilled occupation t6	0,2081***	(8,71)
Low skilled occupation t7	-0,0500	(-1,47)
Low skilled occupation t8	-0,0622	(-1,57)
Low skilled occupation t9	0,0938**	(2,77)
Low skilled occupation t10	0,0384	(0,58)
High skilled occupation t1	-0,1810	(-0,79)
High skilled occupation t2	0,1137	(0,57)
High skilled occupation t3	-0,7385***	(-6,55)
High skilled occupation t4	-0,6001***	(-10,93)
High skilled occupation t5	-0,1394***	(-4,34)
High skilled occupation t6	-0,1795***	(-5,52)
High skilled occupation t7	-0,2032***	(-4,40)
High skilled occupation t8	-0,1866***	(-3,54)
High skilled occupation t9	-0,2072***	(-4,29)
High skilled occupation t10	-0,1866*	(-2,04)
Female t1	0,5449***	(5,15)
Female t2	0,5678***	(4,36)
Female t3	-0,1064	(-1,81)
Female t4	-0,3417***	(-10,60)
Female t5	-0,0242	(-1,19)
Female t6	-0,0498*	(-2,06)
Female t7	0,0990**	(3,00)
Female t8	-0,0678	(-1,72)
Female t9	-0,0940**	(-2,67)
Female t10	-0,1160	(-1,79)
Age t1	0,0081	(1,44)
Age t2	0,0261***	(4,77)
Age t3	-0,0215***	(-7,66)
Age t4	-0,0053***	(-3,74)
Age t5	-0,0067***	(-7,11)
Age t6	-0,0149***	(-13,67)
Age t7	-0,0066***	(-4,40)
Age t8	-0,0104***	(-5,86)
Age t9	-0,0078***	(-5,10)
Age t10	-0,0113***	(-3,60)
Non-German t1	0,0391	(0,21)
Non-German t2	-0,0038	(-0,02)

Table A.4: (continued)

Non-German t3	0,5947***	(8,74)
Non-German t4	0,2890***	(7,73)
Non-German t5	0,2983***	(11,59)
Non-German t6	-0,0687	(-1,81)
Non-German t7	0,0706	(1,41)
Non-German t8	0,1457**	(2,64)
Non-German t9	-0,3369***	(-6,15)
Non-German t10	-0,1659	(-1,69)
Manufacturing t1	0,8132	(1,92)
Manufacturing t2	-0,1124	(-0,24)
Manufacturing t3	2,5939***	(3,67)
Manufacturing t4	-0,0377	(-0,40)
Manufacturing t5	0,9786***	(11,68)
Manufacturing t6	1,7552***	(12,18)
Manufacturing t7	0,1353	(1,54)
Manufacturing t8	1,1584***	(6,46)
Manufacturing t9	1,4787***	(8,24)
Manufacturing t10	-0,1602	(-0,94)
Construction t1	1,4268**	(3,18)
Construction t2	0,1073	(0,17)
Construction t3	1,9481*	(2,56)
Construction t4	0,3407*	(2,37)
Construction t5	0,4467***	(3,75)
Construction t6	0,2024	(1,01)
Construction t7	-1,0696***	(-6,53)
Construction t8	0,0763	(0,33)
Construction t9	0,7073***	(3,33)
Construction t10	-0,5483*	(-2,04)
Wholesale, retail; repair of motor vehicles and goods t1	0,1774	(0,40)
Wholesale, retail; repair of motor vehicles and goods t2	-1,6988*	(-2,35)
Wholesale, retail; repair of motor vehicles and goods t3	1,4076	(1,93)
Wholesale, retail; repair of motor vehicles and goods t4	-0,4848***	(-4,31)
Wholesale, retail; repair of motor vehicles and goods t5	0,3900***	(4,26)
Wholesale, retail; repair of motor vehicles and goods t6	1,4755***	(10,02)
Wholesale, retail; repair of motor vehicles and goods t7	-0,2509*	(-2,50)

Table A.4: (continued)

Wholesale, retail; repair of motor vehicles and goods t8	1,1295***	(6,04)
Wholesale, retail; repair of motor vehicles and goods t9	0,6915***	(3,62)
Wholesale, retail; repair of motor vehicles and goods t10	-0,7384***	(-3,56)
Transport, storage, communication t1	-0,6555	(-1,01)
Transport, storage, communication t2	-15,8238***	(-35,03)
Transport, storage, communication t3	2,5832***	(3,56)
Transport, storage, communication t4	-0,3005*	(-2,29)
Transport, storage, communication t5	0,3922***	(3,93)
Transport, storage, communication t6	1,1159***	(6,97)
Transport, storage, communication t7	0,2846**	(2,73)
Transport, storage, communication t8	0,4240	(1,94)
Transport, storage, communication t9	0,4435*	(2,08)
Transport, storage, communication t10	-0,6727**	(-2,68)
Real estate, renting and business activities t1	-1,3266*	(-2,32)
Real estate, renting and business activities t2	-2,0993***	(-3,71)
Real estate, renting and business activities t3	0,4967	(0,68)
Real estate, renting and business activities t4	-0,8111***	(-7,91)
Real estate, renting and business activities t5	-0,8786***	(-9,39)
Real estate, renting and business activities t6	0,3263*	(2,21)
Real estate, renting and business activities t7	-0,9845***	(-10,37)
Real estate, renting and business activities t8	0,1358	(0,74)
Real estate, renting and business activities t9	0,0796	(0,43)
Real estate, renting and business activities t10	-0,6191***	(-3,45)
Other service activities t1	0,7498	(1,05)
Other service activities t2	-16,1138***	(-34,85)
Other service activities t3	-14,7915***	(-20,35)
Other service activities t4	-0,7765	(-1,33)
Other service activities t5	-0,0279	(-0,09)
Other service activities t6	-0,0180	(-0,04)

Table A.4: (continued)

Other service activities t7	-0,2374	(-0,85)
Other service activities t8	-0,8145	(-1,13)
Other service activities t9	-18,1782***	(-87,18)
Other service activities t10	1,5313***	(5,84)
Year of foundation t1	-0,0575***	(-8,72)
Year of foundation t2	0,0944***	(11,09)
Year of foundation t3	-0,0367***	(-11,85)
Year of foundation t4	-0,0266***	(-18,14)
Year of foundation t5	-0,0053***	(-6,11)
Year of foundation t6	0,0054***	(5,48)
Year of foundation t7	0,0091***	(6,54)
Year of foundation t8	0,0157***	(9,79)
Year of foundation t9	0,0307***	(22,32)
Year of foundation t10	0,0076**	(2,66)
Very small firm t1	0,8811***	(6,56)
Very small firm t2	-0,1362	(-0,36)
Very small firm t3	-0,0043	(-0,02)
Very small firm t4	-0,0728	(-0,68)
Very small firm t5	-0,0017	(-0,03)
Very small firm t6	0,1867***	(3,37)
Very small firm t7	0,2082**	(3,08)
Very small firm t8	0,2904***	(3,69)
Very small firm t9	0,0864	(1,09)
Very small firm t10	0,2762	(1,90)
Medium sized firm t1	-1,7369***	(-12,65)
Medium sized firm t2	-2,6222***	(-5,50)
Medium sized firm t3	-0,4611***	(-5,03)
Medium sized firm t4	0,2436***	(4,54)
Medium sized firm t5	-0,1340***	(-4,75)
Medium sized firm t6	0,0533	(1,69)
Medium sized firm t7	-0,2748***	(-6,56)
Medium sized firm t8	-0,2621***	(-5,30)
Medium sized firm t9	-0,3212***	(-6,82)
Medium sized firm t10	-0,0708	(-0,81)
Large firm t1	-3,3431***	(-17,38)
Large firm t2	0,7915***	(4,04)
Large firm t3	-0,1465	(-1,87)
Large firm t4	0,3407***	(6,70)
Large firm t5	-0,3185***	(-12,01)
Large firm t6	-0,4829***	(-15,42)
Large firm t7	-0,8385***	(-19,42)
Large firm t8	-0,7404***	(-14,88)

Table A.4: (continued)

Large firm t9	-0,4844***	(-10,98)
Large firm t10	-0,4864***	(-5,56)
Observations	631.976	
Number of subjects	91.652	
Number of events	40.149	
Wald Chi^2	637.587,08	
Prob $> Chi^2$	0,0000	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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