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Conference Paper

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Beiträge zur Jahrestagung des Vereins für Socialpolitik 2013: Wettbewerbspolitik und Regulierung in einer globalen Wirtschaftsordnung - Session: Labor Market Policies and Job Loss, No. A18-V2

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Lücke, Christine (2013) : The effects of dismissal protection on the hazard of remaining employed, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2013: Wettbewerbspolitik und Regulierung in einer globalen Wirtschaftsordnung - Session: Labor Market Policies and Job Loss, No. A18-V2, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

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The Effects of Dismissal Protection on the Hazard of Remaining Employed

- Preliminary Version -

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Dismissal protection has experienced many statutory changes in Germany in the past decades. This paper estimates the effects of dismissal protection on the hazard of leaving the establishment using as identification that workers employed before the legal amendment maintained their previous dismissal protection. Utilizing linked employer-employee data (LIAB), the results hint to a higher hazard during the first six month of seniority and a smaller hazard thereafter if dismissal protection is granted. However, the second effect is not significant. I do not find evidence for a positive effect of dismissal protection on matching quality.

Keywords: *Job Security, Dismissal Protection, Cox Proportional Hazard*

1. Introduction

Dismissal protection is a prominent feature of labor market regulation in the European Union. According to the OECD Germany has always had higher-than-average employment protection. Dismissal protection in particular has played a dominant role in German employment protection legislation and has encountered several amendments. The regulation on the applicability of the law has been an item of frequent revision. In particular, small firms are excluded from the law. Nowadays, establishments with less than ten fulltime equivalent employees are considered to be small. However, in the past the threshold alternated between five and ten fulltime equivalent employees.

As Germany is dominated by small and medium sized establishments, changes in the threshold affect a considerable amount of establishments and employees directly. When the threshold was first altered in 1996 according to numbers of the Federal Employment Agency 12.5 % of all establishments in Germany employed between 6 – 9 workers subject to social security. This approximately amounts overall to more than 1.81 million employees directly affected (Günterberg and Wolter 2002).¹

Astonishingly, very few papers study the effects of dismissal protection on job security at employee level while the effects on unemployment as well as hiring and firing rates have often been analyzed empirically. This study attempts to shed light on the influence of dismissal protection on the hazards of being dismissed. Thereby, the adjustments of the threshold in Germany and the fact that workers employed before the legal amendment maintained their previous dismissal protection are used as a quasi-natural experiment to identify effects on individual employment duration.

Dismissal protection imposes legal and administrative costs and may lead to possible redundancy payments. These costs lead to an increased hazard of remaining in a job. However, in Germany dismissal protection may only be called upon after six month of seniority. During this first six month in a job the hazard of being dismissed should be larger if an employee is viable for dismissal protection – the reason being that dismissal protection behaves as sunk costs, thus creating an entry barrier for further employment. Using the linked-employer-employee dataset provided by the IAB the point estimates are supportive of the theory. Additionally, dismissal protection may increase matching efficiency leading to a higher hazard of remaining in the job after protection for reliance on existing law expired. This effect may even overcompensate the incentives to dismiss employees within the first six month of employment. The point estimates indicate a lower hazard of being dismissed if an employee was once viable for dismissal protection. Yet, this result is not statistically significant.

The paper is organized as follows: In part 2 the institutional background of dismissal protection in Germany is introduced. Part 3 gives a summary of empirical literature while

¹ A second adaption of the threshold happened in 1999, affecting approximately 12.1 % of all establishments amounting to overall more than 1.86 million workers subject to social security. In the last adaption of the threshold in 2003 11.9 % of all establishments amounting to more than 1.79 million workers subject to social security were directly affected. However, it has to be kept in mind that these numbers only approximate the number of those directly affected as here weighting schemes for those working part-time are not considered.

part 4 describes the data and sampling methods used. Part 5 presents the empirical strategy while part 6 discusses the results. Part 7 concludes the analysis.

2. Institutional Background

In Germany the “Kündigungsschutzgesetz” KSchG regulates dismissal protection. It allows for dismissals on personal reasons, on ground of conduct or due to redundancies. If the employee doubts the reasons for dismissal he may start a lawsuit. If judged in favor of the former employee the employer may have to pay compensation or reinstate the employee.

The applicability of the law is restricted in three dimensions by §23 (1) KSchG –by type of industry, by the number of fulltime equivalent employees (FEE) and by occupational status. Note, that not the gross number of employees but the number of employees weighted by the hours they worked is decisive. The weighting scheme is also regulated by §23 (1) KSchG.

Whereas the applicability concerning the type of industry and the occupational status remained unmodified the threshold concerning the number of FEE went through several chances.

A first glance on the legal amendments can be gained in figure I. Before 1st October 1996 the exemption was valid for establishments with five or less FEE. This was to change under Chancellor Kohl and the threshold was raised to ten or less FEE. A first draft on the law was presented by back then Secretary of Labor Norbert Blüm in May 1996. In a parliamentary session on 13th September 1996 the law was passed and became effective on 1st October 1996. Next to the threshold the weighting scheme was altered. However, protection for reliance on existing law was granted to those employed before 1st October 1996 by §23(1) sentence 4 KSchG. This implicates that for these employees the old threshold with the old weighting scheme applied. Nevertheless, the number of FEE employed before 1st October 1996 still had to exceed five in order to remain the previous status.

The transitional arrangement just described was to be instated until 30th September 1999. However, with the election of Gerhard Schröder as Chancellor the threshold was

again lowered to five FEE on the 1st January 1999.² Thus, the transitional arrangement was de facto only granted until 1st January 1999.³ The legislation remained in force until 1st January 2004 when Chancellor Schröder raised the threshold again to ten FEE.⁴ Once more protection for reliance on existing law was granted. Unlike the statutory changes in 1996 no ending date was defined so there may even now still be cases where some establishments have employees with and some without dismissal protection.

Figure II gives an overview on which conditions needed to be fulfilled in order to be granted dismissal protection over time.

Throughout the whole time dismissal protection has always become effective after the employees worked continuously for six month in the establishment as is regulated by §1(1) KSchG.

3. Literature Overview

The effects of dismissal protection have been investigated in empirical literature. Two different strands of papers can be distinguished – macro and microeconomic studies.

Following the seminal paper by Lazear (1990), macroeconomic studies are characterized by taking advantage of cross-country variations in constructed indices of the strictness of employment protection legislation (EPL). These include amongst others the provision of dismissal protection. A widely used index is that constructed by OECD (1999) and its follow-up OECD (2004). OECD (1999), OECD (2004) and works of Nickell et al. (2003; 2005) find that flows in and out of unemployment as well as the persistence of unemployment are reduced by stricter EPL using this index. More stringent EPL may reduce the speed of adjustment to external shocks in the economy. However, Nickell et al. (2003; 2005) find no empirical evidence for this argument. Yet, Nickel et al. (2008) investigate the mechanisms of structural change in OECD countries. They find that employment protection slows the speed of adjustment to equilibrium.

² As a result the weighting scheme was also changed. This resulted in generally larger numbers of FEE as now those working less than 10 hours received a higher weight of 0.5 instead of 0.25 as before (see table I)

³ Albeit the abrupt end of the transitional arrangement the legal amendment did not worsen the situation of those persons concerned. By lowering the threshold to five FEE those affected by the transitional arrangement (i) were granted dismissal protection for longer than the expiry on 30th September 1999 (ii) were not exposed to the requirement that at least five FEE employed before 30th September 1996 were still in the establishment.

⁴ It is noteworthy that compared to the 1999 legislation the weighting scheme remained unchanged.

Turning to microeconomic studies one can distinguish those investigating effects on establishments and those identifying effects on individuals.

Borgarello et al. (2004) use administrative Italian Social Security firm-level data and draw from the threshold of 15 employees or more for dismissal protection to be applicable. They estimate transition matrices on the firm level number of employees and find that establishments below the threshold are more reluctant to grow. Establishments at the threshold are more likely to move backwards in the number of employees. Although both effects are statistically significant they are small in magnitude. Kugler and Pica (2008) also employ Italian Social Security linked employer-employee data. They use a legal amendment which unevenly tightened employment protection law for small firms. With a Difference-in-Differences Approach they find that both layoffs and placements declined by almost 15 %.

Boeri and Jimeno (2005) analyze the effects of thresholds in dismissal protection on individual layoff probabilities. They use data from Italian and Spanish Labor Force surveys and find a significant positive effect of dismissal protection on employment stability. Kugler (2000) uses the Columbian labor market reform in 1990 which reduced severance payments in the formal sector employing data from the Columbian National Household Surveys. Applying a Difference-in-Differences Approach she finds the reform led to a reduced average tenure and unemployment duration and increased hazards of flowing in and out of unemployment.

For Germany, many papers use the legal amendments in the thresholds for the applicability of the law described in section 2.

Verick (2004) investigates the impact of the 1999 reform on the firms' inclination to grow beyond the thresholds of applicability of the law. Applying the Difference-in-Differences Approach to a linear probability model he finds that the cut in the threshold in 1999 led to a lower probability of growth for those establishments affected by the amendment. However, since the effect is strongest for those establishments furthest away from the threshold Verick (2004) emphasizes that the results should be interpreted with caution as other institutional or macroeconomic factors may affect treatment and control group differently. Furthermore, he stresses that deficits regarding information on the applicability and subtleties of the law may dampen the significance of the results. Bauer et al. (2007) use a linked employer-employee dataset to investigate the effects of the

reforms changing the minimum establishment firm size for the applicability of the KSchG in both 1996 and 1999 on worker turnover rates employing a Difference-in-Differences Approach. Their results suggest no significant relation between the applicability of dismissal protection and worker turnover.⁵ Boockmann and Hagen (2001) investigate the role of thresholds in dismissal protection on the use of atypical employment. They fail to find empirical evidence for an effect on temporary work agency employment and freelance employment. Yet, they find that the probability of employing fixed term workers decreased for those establishments not coming under the law. However, Fritsch and Schank (2005) do not confirm their results in a study extending the observational period.

One paper that also makes use of methods of survival analysis and investigates the effects of changing thresholds in dismissal protection is a study by Boockmann et al. (2008). However, they apply a Difference-in-Differences Approach and thus, in order to identify parameters, crucially rely on a control group that by assumption only differs from the treatment group insofar as it is not affected by the treatment (i.e. it does not have to grant dismissal protection). They compare the changes in employment stability over time of those affected by the cut of the threshold in 1999 and the changes in employment stability over time of the control group. They find that dismissal protection leads to significantly higher employment stability after one year of employment if the control group of establishments with 11 - 14 FEE is used. Their results become insignificant once the control group of establishments with 1 - 4 FEE is used which points to a lack of robustness of the results. They pay attention to the protection for reliance on existing law by only including newly employed in their analysis.

In my study the reliance on existing law is the key to identifying effects of dismissal protection. This paper contributes to the empirical literature by using survival analysis methods and using the reliance on existing law as identification. Thus, both employees with and without dismissal protection are examined. Therefore, there is no need for using control groups.

⁵ Bauer et al. (2007) also use cross-sectional analysis to find slight evidence that worker turnover is lower for those establishments under the law. However, the authors themselves claim that the results rely on strong identifying assumptions and are “not satisfactorily robust over plausible specifications of the underlying empirical model”.

4. Data

4.1. Data source

This paper uses the longitudinal model of the Linked-Employer-Employee Data (LIAB) (Version 3, Years 1993-2007) from the IAB. Data access was provided via on-site use at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB) and subsequently remote data access. These data allow following the working history of a person (see Jacobebbinghaus, 2008 for details). The LIAB Version 2 uses a sample of all establishments in Germany, stratified by size, type of industry and federal state. Once the establishments were drawn, the working histories of all employees that were employed for at least one day during the interval of 1st January 1993 to 31st December 2006 are covered. Thus, for these establishments information on all employees from 1993 to 2006 is available and the duration of employment as well as first and last day of employment is known.

Each employee is identified by a person-specific id. Furthermore, establishments are also identified by a unique establishment-id. For each individual, observation starts with the first day of employment at an establishment. The observation ends at the last day of employment. Any changes during an employment spell, e.g. in the number of hours worked are observed on a daily basis. This allows building a panel for each establishment containing information on all employees for each day of the observational period.

4.2. Weighting

Unfortunately, the weighting scheme of the law could not be accounted for exactly as the data only give information whether a person worked full time or part time. Additionally, if a person worked part time the data give information whether she worked more or less than half of the fulltime hours. Table I summarizes the differences between the weighting scheme applied by law and the one (potentially) used in the analysis. As can be seen from the table, deviations from the actual number of FEE occur for the time before 1st October 1996. These are potentially caused by the inclusion of those working less than 10 or more than 45 hours. Thus, the number of FEE calculated from the data is higher than in reality.⁶ In the time span between 1st October 1996 and 1st January 1999 the number is

⁶ However, by assuming that marginally employed work less than ten hours per week an approximation can be attained.

again too high as those working less than 10 hours receive a weight of 0.5 in the analysis instead of 0.25 set by law. After 1999 the weighting scheme set by the law and the one used in the analysis do not differ much. This points to use the legal amendment of 2003 to identify effects from dismissal protection. Future research may repeat the analysis for the 1996 amendment as a robustness check.

4.3. Sampling

Only those establishments with more both than five and ten or less employees on 31st December 2003 are included in the sample as these are the only establishments to conceivably both have employees with and without dismissal protection simultaneously. At first, all individuals are kept in the analysis to determine the number of FEE. Apprentices and non-dependent employees were not included in the analysis as the KSchG explicitly specifies that these groups shall not be considered (§23 and §17(5) KSchG).

After having determined the number of FEE only individuals starting an employment one year before or after the date of the statutory change in law were analyzed. The choice of one year is of course chosen arbitrarily. In order to avoid strategic behavior a window of one month is laid around the date of legal amendment, i.e. 31st December 2003. Employees recruited in this window are exempted in the survival analysis but are of course included in the calculation of the number of employees. This window guarantees that there was enough time in between the change for the establishment to be aware of the new regulation. Otherwise, effects from e.g. better matching quality might be flawed. Following Boockmann et al. (2008) employees that are former apprentices to the establishment are dropped from the analysis as the comparability with new entrants is not given.

5. Empirical Strategy

The overall aim is to evaluate whether dismissal protection has a protecting effect on individual job security. To analyze the effects survival analysis is applied. Thereby, the impact of dismissal protection on the hazard of being dismissed is evaluated. A brief summary of the descriptive statistics is given in table II.

5.1. Hypotheses

During the first six month of employment the hazard of being dismissed is hypothesized to be higher for employees protected by the law. As dismissal protection “kicks in” after six month, there is an incentive to dismiss employees before the threshold is exceeded. Dismissal protection behaves as sunk costs, thus creating an entry barrier for further employment. The Difference-in-Differences estimation of Boockmann et al. (2008) indicates this effect; however their results are not significant.

After six month the hazard of being dismissed should be smaller for those under the protection of the law. Dismissal protection creates additional costs when dismissing an employee. Thus, the decision to dismiss workers may be altered by the provision of dismissal protection to some employees. Employees that would have been dismissed might be further employed and, vice versa, employees that might have stayed in the establishment if all employees had equal status might now be dismissed.⁷ Thus, the legal amendment may even influence the hazard of being dismissed for those who have not experienced a change in their status. Specifically, there are two underlying possibilities. First, the firm might experience a downturn in its performance and has the need to dismiss a certain amount of workers. Here, dismissal protection has an impact on those granted with and those without protection. Those with dismissal protection have a lower risk of being dismissed as extra costs of dismissal are associated with it.⁸ Those without dismissal protection are now in relative terms cheaper to dismiss. Their position is now even worse than in a case where no one had dismissal protection. Compared to the situation before the legal amendment those who always had dismissal protection are now better off. In the second scenario the establishment might want to dismiss a worker due to a mismatch. Here, the hazards of being dismissed for those employed without dismissal protection are higher than for those with dismissal protection.⁹ Compared to the situation before the legal amendment, those with dismissal protection experience no change. Those who are newly employed without dismissal protection experience a worsening in their situation.

⁷ That is, if the effects from increasing matching quality are neglected.

⁸ Even if the dismissal is juristically correct, the dismissed worker might still file a lawsuit generating additional costs for the establishment.

⁹ Under the premise that establishments will dismiss workers if the value of the match is below a certain threshold, the introduction of dismissal protection can be considered as increasing the threshold due to the additionally imposed firing costs.

After the transitional period has ended, which means that all employees in the establishment have equal status regarding dismissal protection, employees who once had dismissal protection are less likely to be dismissed in all following future periods. This results from the increased matching quality. Due to the costs imposed by dismissal protection establishments have the incentive to enhance the matching process. Thus, better matching employees are hired. This hypothesis was formalized by Boockmann and Hagen (2008).

5.2. Econometric Approach

To identify the effects of dismissal protection discontinuities in the assignment are used. Individuals employed after the change in legislation are not protected by the law. Thus, the date of placement in the job creates a discontinuity in the treatment and sharply determines the status of dismissal protection at entry.

The formalization looks as follows:

$DP_i \in \{0,1\}$ depicts a binary treatment variable which indicates whether individual i receives the treatment of dismissal protection ($DP_i = 1$) or not ($DP_i = 0$). The assignment to treatment is determined by a covariate Z whose relative position to the threshold c determines the value of the treatment variable in a way, that

$$DP_i = 1 \text{ iff } Z_i \leq c \quad (1)$$

The forcing covariate Z is the date of placement and the threshold equals the date of the change in legislation, 31st December 2003. As the protection for reliance on existing law can expire the status of dismissal protection may change over the time. Yet, it can always be perfectly determined. Since survival analysis tools are employed, the analysis concentrates on the hazard rate $h(t)$, where t is the number of days since the beginning of the employment spell. The hazard rate to be estimated is:

$$h_{ij}(t) = h_0(t) v_j \exp(\beta_1 g_{1i} DP_{ij} + \beta_2 g_{2i} DP_{ij} + \beta_3 DP_{ij} (Z_i - c) + \beta_4 (1 - DP_{ij}) * (Z_i - c) + \beta_5 OfE_{ij} + \beta_6 X_{ij}) \quad (2)$$

For estimation Cox' proportional hazard model is used. This semi-parametric model allows - under the assumption of proportional hazards over time - to identify the (vector of) parameters β_1 to β_6 without specifying the baseline hazard $h_0(t)$. Fully parametric models are used as a robustness analysis. These models also assume proportional hazards over time. If the hypotheses are true this assumption is not met in the analysis per se. As

the aim of this paper is to analyze the time-varying effect of dismissal protection, a time interaction is included for theoretical reasons. This interaction also serves to reinstall proportional hazards. Technically, the variable DP is interacted with the Heaviside functions g_{1i} and g_{2i} , with

$$g_{1i} = \begin{cases} 1 & \text{if } t \leq 182 \\ 0 & \text{if } t > 182 \end{cases} \quad (3)$$

$$g_{2i} = \begin{cases} 0 & \text{if } t \leq 182 \\ 1 & \text{if } t > 182 \end{cases} \quad (4)$$

The causal impact of dismissal protection on the individual risk of being dismissed during the first six month of tenure is depicted by β_1 . The causal effect after six month of tenure is depicted by β_2 . Following Caliendo et al. (2012) the terms $\beta_3 DP_i (Z_i - c) + \beta_4 (1 - DP_i) * (Z_i - c)$ are included to adjust for seniority effects. As those who experience dismissal protection exhibit by definition longer seniority, this covariate must be accounted for to attain unbiased estimates. Additionally, the relative position of a person regarding its chronological order of entry (OfE) is included to account for seniority effects, i.e. if a person is the employee with the longest tenure that person is assigned a value of one, if she is the employee with the second longest tenure she is assigned a value of two, and so forth.

The vector X includes other covariates that influence the hazard of being dismissed.¹⁰ To capture establishment level heterogeneity the term v_j is included in the specification, where j represents the establishment. This is equivalent to random effects in probit estimations.

5.3. Assignment to Dismissal Protection

Especially small establishments, such as they are analyzed here, may not be sensitive to the subtleties of German Dismissal Protection Legislation. Large firms may install a legal department. For most small establishments with less than ten employees this seems

¹⁰ These include covariates on individual traits (age, age², sex, education, and geographic region) and on business-level (log-business volume, legal status.) as well as the log-daily pay.

unlikely. Thus, establishments may falsely assign an employee dismissal protection although, by law, he might not be viable for dismissal protection, and vice versa.

One might come up with several assignment rules. Three of these shall be discussed here. First of all, establishments might not at all be aware of the protection for reliance on existing law. These establishments would assign the dismissal protection status to its employees purely on grounds of the date of employment. If an employee entered the establishment on or before 31st December 2003 he would be assigned dismissal protection, otherwise not. This rule of assignment is the least complex for the establishments. A second definition assigns dismissal protection depending on the date of entry and the number of FEE (and not on the number of FEE employed before 31st December 2003). A third definition might perfectly follow the law. Thus, the assignment depends on the date of employment, the number of FEE and the number of FEE employed before 31st December 2003. This is the definition with the highest complexity for the establishments. This strict definition is used in this analysis and the final version of the paper will incorporate the other definitions as robustness checks as well.

6. Results

A first impression of the effects of dismissal protection can be gained in table III. This table shows the number of individuals depending on the status of dismissal protection. It can be seen that after six month of tenure the number of individuals with protection declines stronger than the number of individuals without protection. However, the evidence from table III is not clear cut as transitions between the two groups might have happened, blurring the results.

Another impression on the effects of dismissal protection can be gained by looking at the Kaplan-Meier-Survivor plots in figure III. They plot the proportion of individuals still employed by their dismissal protection status as time progresses. One can see that the difference in the survival rate between those granted dismissal protection and those not granted diverges during approximately the first 200 days. Afterwards, the two graphs move almost parallel, pointing towards hypothesis one but not supporting hypothesis two. These plots are not contingent on other covariates and are thus only of descriptive power, so that in the following the estimation results are discussed.

6.1. Cox Proportional Hazard Model - Results

In order to distinguish the effects of dismissal protection during the first six month of employment and all subsequent periods the variable *DP* is interacted with time. *DP* gives the estimates for the first six months (β_1), *DP**after* the estimates for all subsequent periods (β_2).

The point estimates in table IV indicate that dismissal protection works just as expected. During the first six month the hazard of being dismissed for those viable for dismissal protection is 1.48 times the hazard for those not viable. After six month the effect changes direction and those protected by dismissal protection are less prone to be dismissed. Whereas the first effect is highly significant the second effect fails to reach a significance level of 10 %.

To analyze the third hypothesis the data are set such that the subjects only become at risk after the reliance on existing law has ended, thus everyone having the same status of dismissal protection. This reduced the sample substantially from 688 to 571 subjects. The influence of having been granted the transitional arrangement is captured by the variable *DP**ever*.

Again, the point estimates in table V point in the right direction. Having been eligible for dismissal protection reduces the risk of being dismissed by approximately 5 %. This hints towards increased matching quality incentivized by the additional firing costs imposed by dismissal protection. Yet, the effect is statistically far from significant. The results presented in table V are in general less significant than the other results, most probably due to the lower number of observations.¹¹

Tables IV and V show that the frailty on establishment level incorporated is indeed significant.

6.2. Robustness

In order to check the results for robustness the analysis is repeated with fully parametric survival models. As accelerated failure time models do not fit the data for theoretical reasons, i.e. instead of an accelerated failure time one would rather assume a generally

¹¹ In an additional robustness analysis all cases where the number of FEE climbed above 10 were excluded. This is because the last person employed must have been extremely valuable to the firm, as this person makes protection available to everyone. Unfortunately, this resulted in a low number of observations and Cox partial likelihood estimates could not be obtained. Using the parametric Gompertz Model all results are highly insignificant.

constant effect over time, parametric proportional hazards models are estimated. As table VI shows, the log likelihood as well as the AIC point towards the Gompertz-Model. Generally, the results from all parametric models are in line with the results from the Cox model. It has to be noted that both the log likelihood and the AIC cannot be compared between the Cox and any parametric model as the estimation techniques differ. Since the standard errors appear the smallest for the Cox model it is the one applied in all following analyses. A check using Cox-Snell Residuals also points to using the Cox proportional hazard model.

In order to check whether strategic behavior influences the results the window of one month before and after 31st December 2003 is included in the analysis as a robustness check. Table VII shows that the results hardly change. It is thus concluded that selection or strategic behavior does not constitute a problem in the analysis.

Another robustness check repeats the analysis separately for the time before and after the probation period. This analysis has the great advantage that no time interactions have to be included in order to restore proportional hazards. The results are reported in tables VII and VIII. For the first six month the point estimate hints towards a higher risk of being dismissed if dismissal protection is granted. However, the point estimate is not significant at the usual levels. For the period afterwards the number of observations is rather small and the point estimates again fail to provide significant results. This low number of observations for the time after the probation period may explain why the effect of dismissal protection after the probation period never reached a significant level.

7. Conclusion

In Germany, several legal amendments concerning the applicability of dismissal protection have potentially influenced the working histories of a considerable amount of employees. This study shed some light on the influence of such regulation on employment durations.

The estimation results indicate that dismissal protection increases the hazard of being dismissed during the first six month of seniority and decreases the hazard afterwards, with the second effect not being significant. Additionally, an effect on an increased matching quality could not be found. However, the estimates only provide a first insight and should be treated with caution.

A reason to treat the estimation results with caution lies in the data. Unfortunately, one cannot determine whether the employer or employee filed the end of the employment. This should, however, not influence the results if the incidence of resignation is equally distributed between those viable for dismissal protection and those not viable. Additionally, there may be deviations from the actual FEE and the FEE calculated in the analysis.

Further research may make an effort to empirically disentangle the opposing effects of the additional sunk firing costs imposed after six month of seniority and increased matching quality despite the effect of an increased matching quality being non-significant in this study. As Boockmann and Hagen (2008) derived formally, the additional firing costs incentivize to increase the quality of matches. However, once employed the nature of the additional firing costs as sunk costs incentivizes to end bad matches within six month of seniority. Additionally, a robustness check applied in future research is analyzing the first hypothesis by using a probit estimation and repeating the analysis for the legal amendment in 1996.

APPENDIX

FIGURE I: Status of dismissal protection for new hires

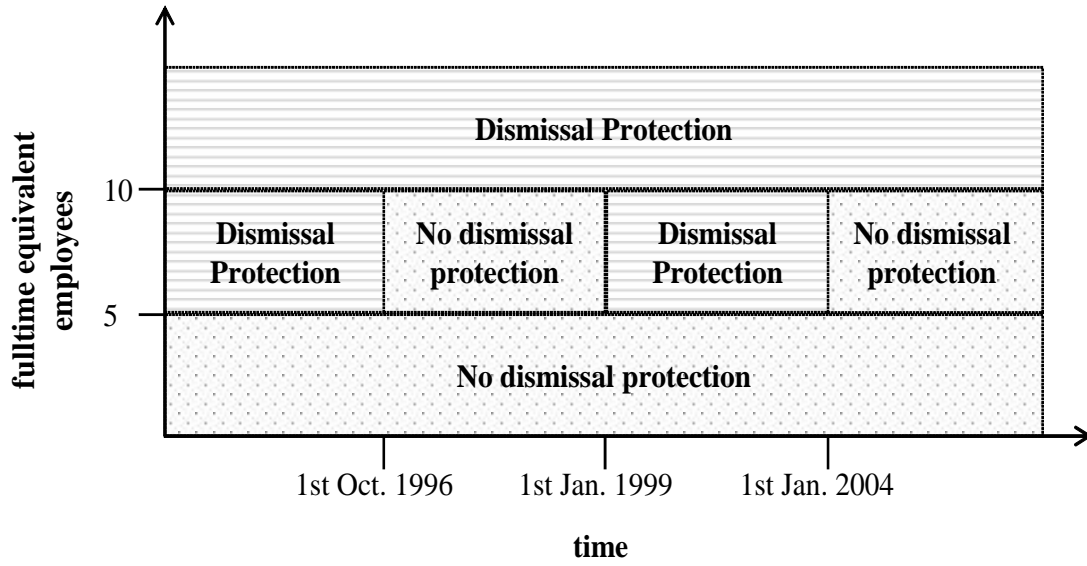
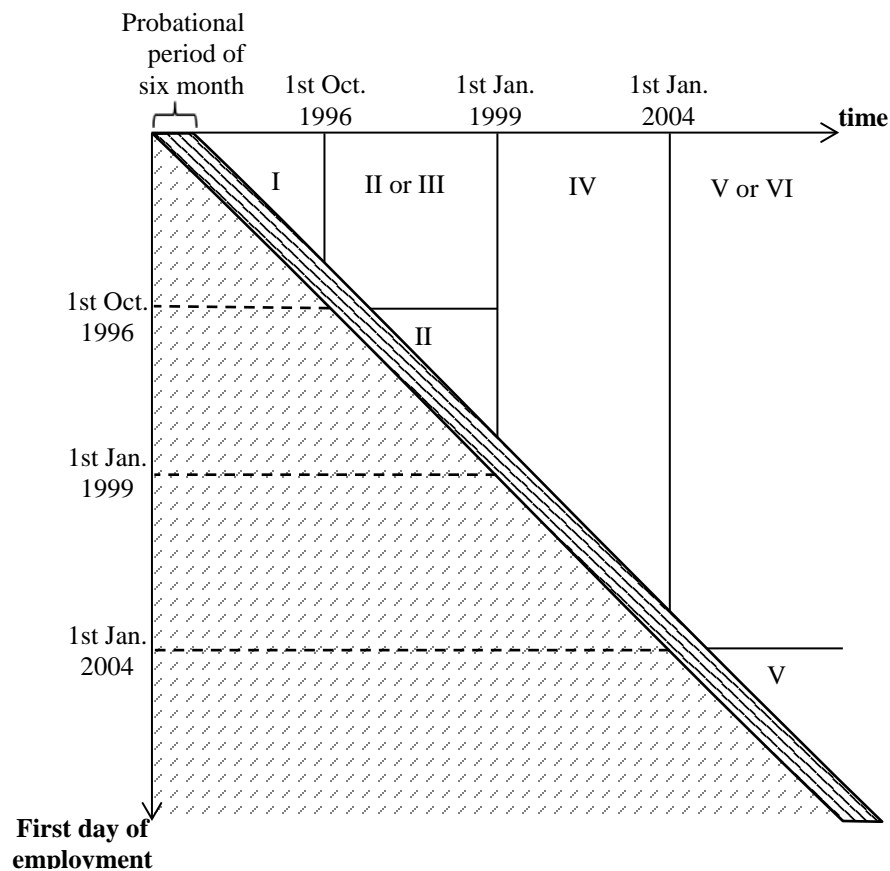


FIGURE II: Conditions for Dismissal Protection



- Conditions for Dismissal Protection:**
- I: FEE > 5, applying weighting scheme before 1996
 - II: FEE > 10, applying weighting scheme 1996 – 1998
 - III: FEEold > 5, applying weighting scheme before 1996
 - IV: FEE > 5, applying weighting scheme since 1999
 - V: FEE > 10, applying weighting scheme since 1999
 - VI: FEEold > 5, applying weighting scheme since 1999

Note: FEE refers to the number of fulltime equivalent employees; FEEold refers to the number of fulltime equivalent employees where only those having been employed before the 1st October or 1st January, respectively, have been considered. Weighting schemes can be found in table I.

FIGURE III: Kaplan-Meier Graph

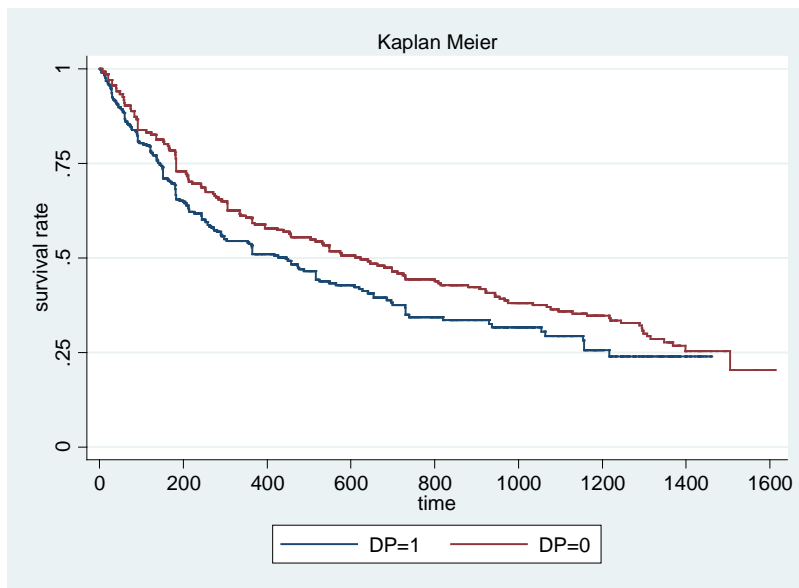


TABLE I: Weighting Schemes

Weighting scheme defined by law			
Number of hours worked per week	Weighting scheme before 1996	Weighting scheme between 1996 - 1999	Weighting scheme since 1999
[0;10)	0	0.25	0.5
[10;20]	1	0.5	0.5
(20;30]	1	0.75	0.75
(30 – 45)	1	1	1
[45; ∞)	0	1	1

Weighting scheme (potentially) used in the analysis			
Number of hours worked per week	Potential weighting scheme before 1996	Potential weighting scheme between 1996 - 1999	Weighting scheme since 1999
Part time			
$[0; \frac{1}{2} \text{ fulltime}]$	1	0.5	0.5
$(\frac{1}{2} \text{ fulltime}; \text{fulltime})$	1	0.75	0.75
Fulltime	1	1	1

TABLE II: Selected descriptive statistics

	Mean	Standard error	Minimum	Maximum
Dismissal protection*	0.475	0.499	0	1
Order of entry	3.017	2.748	1	21
Male*	0.500	0.500	0	1
Age*	39.671	12.070	15	65
West Germany*	0.441	0.497	0	1
Log daily pay	3.874	0.964	-0.916	5.172
Log business volume	14.693	1.461	11.918	17.764

Note: * indicates that the numbers represent percent of all observations.

TABLE III: Observations over time

	[0,6) months	[6-12) months	[12-18) months	[18-24) months	[24-36) month	[36-∞) months
DP=0	345	155	131	91	86	71
DP=1	417	95	70	47	32	23

TABLE IV: Regression results – first and second hypothesis

	Hazard ratio	Standard error	p-Value	95 % Interval	
<i>DP</i>	1.484***	0.217	0.007	1.115	1.976
<i>DP</i> _{after}	0.828	0.132	0.235	0.605	1.131
$(Z_i - c)$	1.000***	0.001	0.008	1.000	1.000
$DP \cdot (Z_i - c)$	1.000	0.001	0.604	1.000	1.000
<i>Order of entry</i>	1.062	0.045	0.151	0.978	1.153
<i>theta</i>	0.298***	0.088			
<i>No of subjects</i>	688				
<i>No of failures</i>	491				
<i>No of groups</i>	156				
<i>Log likelihood</i>	-2791.737				
<i>Prob>χ^2</i>	0.000				

Likelihood-ratio test of $\theta=0$: $\text{chibar2}(01) = 35.35$ $\text{Prob} > = \text{chibar2} = 0.000$

Note: ***/**/* indicate significance at the 1%/5%/10% levels. Control variables included but not presented.

TABLE V: Regression results – third hypothesis

	Hazard ratio	Standard error	p-Value	95 % Interval	
<i>DP</i> _{ever}	0.945	0.153	0.729	0.689	1.298
$(Z_i - c)$	1.000**	0.001	0.015	1.000	1.000
$DP \cdot (Z_i - c)$	1.000	0.001	0.821	1.000	1.000
<i>Order of entry</i>	1.049	0.046	0.280	0.962	1.143
<i>theta</i>	0.339***	0.112			
<i>No of subjects</i>	571				
<i>No of failures</i>	396				
<i>No of groups</i>	144				
<i>Log likelihood</i>	-2104.944				
<i>Prob>χ^2</i>	0.000				

Likelihood-ratio test of $\theta=0$: $\text{chibar2}(01) = 26.11$ $\text{Prob} > = \text{chibar2} = 0.1000$

Note: ***/**/* indicate significance at the 1%/5%/10% levels. Control variables included but not presented.

TABLE VI: Robustness – Cox vs. parametric models

	Cox	Weibull	Exponential	Gompertz
<i>DP</i>	1.484*** (0.007)	1.407*** (0.005)	1.464*** (0.002)	1.209 (0.117)
<i>DPafter</i>	0.828 (0.235)	1.066 (0.682)	1.070 (0.662)	0.983 (0.916)
$(Z_i - c)$	1.000*** (0.008)	1.000*** (0.000)	1.000*** (0.000)	1.000*** (0.002)
$DP \cdot (Z_i - c)$	1.000 (0.604)	1.000** (0.021)	1.000** (0.017)	1.000 (0.427)
<i>Order of entry</i>	1.062 (0.151)	1.010 (0.781)	0.999 (0.970)	1.074* (0.055)
<i>Log likelihood</i>		-1036.971	-1037.217	-1028.728
<i>AIC</i>		2149.944	2148.435	2133.456

Note: ***/**/* indicate significance at the 1%/5%/10% levels. Control variables included but not presented. p-values in parenthesis.

TABLE VII: Robustness – Selection

	Estimation without selection	Estimation with possible selection
<i>DP</i>	1.484*** (0.007)	1.457*** (0.006)
<i>DPafter</i>	0.828 (0.235)	0.813 (0.180)
$(Z_i - c)$	1.000*** (0.008)	1.000*** (0.009)
$DP \cdot (Z_i - c)$	1.000 (0.604)	1.000 (0.381)
<i>Order of entry</i>	1.062 (0.151)	1.039 (0.328)
<i>theta</i>	0.298*** (0.000)	0.308*** (0.000)
<i>No of subjects</i>	688	769
<i>No of failures</i>	491	543
<i>No of groups</i>	156	162
<i>Log likelihood</i>	-2791.737	-3134.768
<i>Prob>χ^2</i>	0.000	0.000

Note: ***/**/* indicate significance at the 1%/5%/10% levels. Control variables included but not presented. p-values in parenthesis.

TABLE VIII: Robustness – separate estimations

	[0-6) months	[6-∞) months
<i>DP</i>	1.218 (0.208)	1.188 (0.526)
$(Z_i - c)$	1.000*** (0.000)	1.000 (0.173)
$DP \cdot (Z_i - c)$	1.000 (0.551)	1.000 (0.459)
<i>Order of entry</i>	0.969 (0.660)	1.020 (0.777)
<i>theta</i>	0.487*** (0.000)	0.391** (0.043)
<i>Number of subjects</i>	680	257
<i>Number of failures</i>	290	107
<i>No of groups</i>	153	124
<i>Log likelihood</i>	-1733.965	-506.027
<i>Prob>χ^2</i>	0.000	0.071

Note: ***/**/* indicate significance at the 1%/5%/10% levels. Control variables included but not presented. p-values in parenthesis.

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