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See you soon: fixed-term contracts, unemployment and recalls in Germany—a linked employer–employee analysis

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Abstract

Almost 20% of all male employees in Germany who become unemployed return to their previous employers. Such temporary layoffs and the subsequent recalls are often used by firms to shift their labor costs onto society and the unemployment benefit system, which has led to various legislation aimed at prohibiting or reducing this undesired instrument in Germany. I analyze the interplay between fixed-term contracts, which can be used to undermine legal regulations, and temporary layoffs for men. For this purpose, I use comprehensive administrative data at individual level, complemented by various firm characteristics. My results show that unemployed workers who had previously worked on fixed-term contracts are more often recalled by their previous firms than workers who had permanent contracts. Moreover, older and low-skilled employees as well as migrants are particularly affected by the interplay between fixed-term contracts and temporary layoffs. This is also confirmed for women in an additional robustness analysis.

Keywords Unemployment · Wage · Recall · Fixed-term contracts · Unobserved heterogeneity

JEL Classification J64 · J65 · J41

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1 Introduction and literature

Unemployed workers re-entering employment can either start working for a new firm or return to their previous firm.¹ The literature provides various theoretical models addressing the latter case, known as recalls. Feldstein (1976) and Baily (1977) build on the implicit contract theory to motivate recalls: Firms temporarily lay off workers to compensate for a decrease in demand, and recall them at a later point in time. This approach is linked to an implicit agreement according to which laid-off workers will be recalled as soon as the firm's situation improves. Thus, temporary layoffs and recalls can be used as an instrument to shift labor costs onto the economy or the unemployment insurance system (UI), as shown by Albertini et al. (2020). Analyzing the job search behavior of employees during a temporary layoff, for instance, White (1983), Mortensen (1990) or Fujita and Moscarini (2017) reveal a lower search effort among workers who expect to be rehired. However, their search effort increases the longer the period of unemployment lasts in order to avoid negative effects on their productivity.

Empirical studies analyzing this topic show high numbers of recalls and thus the relevance of recalls for the likelihood of unemployed individuals re-entering employment. Figures of 30% or more are found by almost all international studies, such as for the U.S. (Katz and Meyer 1990), Spain (Alba-Ramírez et al. 2007; Arranz and García-Serrano 2014), Austria (Böheim 2006; Nekoei and Weber 2015, 2020) or Sweden (Jansson 2002; Nivorozhkin 2008). For Germany, the corresponding figures are somewhat lower, ranging from 17 to 22% (Mavromaras and Rudolph 1995, 1997, 1998; Liebig and Hense 2007; Edler et al. 2019). Despite these high figures, the topic of temporary layoffs or recalls by previous employers is still often neglected when explaining unemployment dynamics, even though it is a popular instrument used by firms to reduce costs (Liebig and Hense 2007).

Studies for Germany indicate large differences in the effects of recalls on employment and in the frequency of use between industry sectors. In particular the construction sector, but also hotels and restaurants, use recalls frequently (Edler et al. 2019). This is due above all to seasonal fluctuations in demand (Mavromaras and Rudolph 1995) and in economic activity (Liebig and Hense 2007, Nekoei and Weber 2020). Moreover, Mavromaras and Rudolph (1998) provide evidence of more frequent recalls in small firms and explain this by the absence of works councils in smaller firms, which tend to reject this instrument.

Concerning the impacts of recalls, some studies find direct effects on wages. Kodrzycki (2007) and Edler et al. (2019) reveal wage penalties for rehired workers compared to workers not affected by temporary layoffs. However, re-employed workers earn higher wages in comparison to new employees. Mavromaras and Rudolph (1997) provide further evidence of higher wage penalties for re-employed women, suggesting discrimination.

¹ Hereafter I will use “firm” and “establishment” synonymously.

An important but neglected aspect that is closely related to temporary layoffs and recalls concerns fixed-term contracts, as shown by Alba-Ramírez et al. (2007) and Arranz and García-Serrano (2014) for Spain. Accordingly, Spanish firms use fixed-term contracts, which enable them, amongst other things, to reduce cost-efficient work force by not extending these contracts as, for example, no redundancy payments have to be paid and no social aspects have to be considered. At the same time, firms still have the option of re-employing laid off workers at a later date if, for example, demand for goods rises. In this way, fixed-term contracts can be used to conduct recalls in Germany as well and to undermine employment protection laws, which usually prohibit temporary layoffs.

Analyzing recalls in Spain, Alba-Ramírez et al. (2007) obtain results indicating that the probability of a recall is higher for unemployed workers who had previously had a fixed-term contract. Arranz and García-Serrano (2014) also provide evidence that firms use fixed-term contracts to mitigate seasonal fluctuations in demand and recall laid off workers later. Further, they demonstrate that the instrument of fixed-term contracts is an essential part of Spanish firms' business strategies.

I build on previous studies on recalls and closely follow the work of Mavromaras and Rudolph (1995), Liebig and Hense (2007), Alba-Ramírez et al. (2007), and Arranz and García-Serrano (2014). In particular, I analyze the importance of recalls for the German labor market and the relevance of fixed-term contracts in this context. The interplay between fixed-term contracts and recalls is particularly relevant in the German context, as the German labor market is considered less flexible due to strong employment protection laws. These laws make temporary layoffs and recalls more difficult to use.

I use a large administrative individual data set, linked to establishment data for the years 2012–2017. Due to the administrative character of the data and information on individuals on a daily basis, the data are highly accurate and reliable. I can thus precisely identify transitions from unemployment to employment and control for various characteristics, such as wage, industry sector, occupation, education, or region.

I provide at least three important contributions. First, I analyze the relationship between fixed-term contracts and recalls for Germany, which was not yet examined for Germany. Second, I consider seasonal and business-cycle recalls with regard to fixed-term contracts, which was not yet addressed by previous literature, either. Third, the extensive and accurate data, which are not available in most comparable studies, enable me to provide a more detailed picture of unemployment dynamics related to temporary layoffs.

Using a competing risk framework based on survival time analysis with unobserved heterogeneity, my results indicate an interplay between fixed-term employment contracts, unemployment and recalls for Germany. Unemployed workers who were previously employed on fixed-term contracts are more often rehired by their previous firms. This applies in particular for women and migrants. Furthermore, my results provide evidence that firms use recalls to cope with seasonal fluctuations.

The paper is organized as follows. Section 2 provides information on legal regulations and the identification strategy. The data, the summary statistics for the main variables as well as the data preparation are described in Sect. 3. Sections 4

and 5 present the estimation and sensitivity analyses, respectively. Finally, Sect. 6 concludes.

2 Legal regulations and conceptual framework

In principle, there can be various reasons for employees returning to their old firm. Some are listed by Mavromaras and Rudolph (1995): Individual and voluntary reasons, such as having taken a sabbatical or attended a training course abroad, insurance-related reasons, such as maternity leave, and specific reasons like military service might be possible as well.

However, I am interested in cases that are economically motivated and determined by the firm, implying temporary layoffs coupled with spells of unemployment for workers. From the perspective of employment policy, these temporary layoffs are an undesirable instrument. On the one hand, such involuntary and temporary layoffs might be at the expense of the economy and the unemployment benefit system if firms use them as a flexibilization strategy, for example to counteract seasonal fluctuations (Albertini et al. 2020; Liebig and Hense 2007). On the other hand, this issue is linked to individual effects for the workers concerned, as periods of unemployment imply considerably lower earnings and persistent effects, for example on pensions, as well as various other negative effects as discussed by Carrington and Fallick (2017) or Potrafke (2012).² For this reason, German laws, such as the Dismissal Protection Act (*Kündigungsschutzgesetz*) and the Law on the Promotion of Employment (*Arbeitsförderungsgesetz*) feature different instruments to keep workers in employment. The latter includes tools like short-time working (*Kurzarbeit*) and seasonal short-time working (*saisonale Kurzarbeit*). These instruments are intended in particular for firms that are subject to strong seasonal fluctuations. These include, for instance, the construction sector and sectors that are exposed to declining demand due, for example, to economic downturns.

2.1 Legal regulations

The Dismissal Protection Act permits only a few specific reasons for dismissing workers who have permanent and open-ended employment contracts. On the one hand, these are reasons related to personal misconduct, e.g., theft (Jahn 2009). On the other hand, they include dismissal for operational or economic reasons (*betriebliche Kündigung*) (Stephan 2006; Struck et al. 2007). However, dismissals for operational reasons are subject to various regulations and laws. Firms must prove a decline in business that is expected to persist in the future (Jahn 2009). Furthermore, firms conducting dismissals for operational reasons must take into account different

² Previous literature for Germany analyzing pay gaps of temporary agency workers whose employment strongly follows seasonal fluctuations indicates no compensation with regard to wages (Jahn and Pozzolli 2013; Jahn and Bentzen 2012). These findings argue rather for no compensation of the increased unemployment likelihood of jobs linked to seasonal fluctuations.

social criteria among workers, which includes, e.g., the number of children or a disability status (Jahn 2009). These social criteria norms and thus the associated ranking of workers are uncertain in legal terms as the legislation does not weight these criteria, which leads to considerable insecurity in a judicial settlement (Jahn 2005, 2009). In order to avoid such settlements, firms tend to make severance payments when dismissing workers with permanent contracts, which makes layoffs costly.

However, there are ways to avoid such costs. Firms might use agency workers, hiring them from an agency for a certain period and releasing them when they are no longer required (*Leiharbeit*). Further, firms might use fixed-term contracts. On the one hand, this type of contract is often used as an extended trial period, which functions as a filter and prevents firms from employing less productive workers. On the other hand, they give firms the possibility of not renewing these contracts if demand declines. Since lawmakers are also aware of these options and of possible exploitation at the workers' expense, there are a number of laws to protect this worker group.³ In particular, the use of successive fixed-term contracts is only allowed for a total duration of up to two, or in exceptional cases of up to four, years of employment.⁴ However, this restriction itself may lead to temporary layoffs and recalls. Employees can take on a 4 month period of unemployment after the maximum fixed-term period in order to interrupt the factual connection (*sachlicher Zusammenhang*) of the fixed-term contract and begin a new fixed-term job in the previous firm.⁵ Thus, the law that is intended to protect vulnerable groups may itself lead to temporary layoffs.

However, these circumstances are taken into consideration by lawmakers, leading to some privileges for this vulnerable group of workers employed on fixed-term contracts with regard to their eligibility period for unemployment benefits. Workers in seasonal unemployment or working on fixed-term contracts usually require only 6 instead of 12 months of employment subject to social security contributions in the last 30 months in order to be eligible for unemployment benefit. For those who do not fulfill these criteria or whose unemployment benefit entitlement is exhausted there is the possibility to apply for unemployment assistance (UA), which is financed by taxes and provides a minimum income.

For the identification of temporary layoffs, I use the information on unemployment benefit receipt since the data do not include reasons for separation. Using benefit receipt spells instead of non-employment periods to identify recalls has the advantage of focusing on temporary layoffs, which are rather driven by firms and linked to costs for the unemployment benefit system. Further, this approach makes sure that affected workers are in fact unemployed and not self-employed in the meanwhile.⁶ In addition to the latter argument, this approach is in line to a potential

³ Possible exploitations could relate to e.g. reduced or denied establishment pension payments or insufficient job and qualification trainings, which might affect future outcomes of affected workers.

⁴ This does not cover fixed-term contracts in research and education, which may be longer.

⁵ If the period of unemployment lasts less than 4 months, the work is assumed to be related to the previous context and a new fixed-term contract is not allowed.

⁶ This approach also leads to an underestimation of recall rates in Germany, as temporary layoffs indicated by periods of non-employment are not considered. Nevertheless, these cases are rather an excep-

strategy used by firms to increase flexibility and to shift labor costs to the UI system (Albertini et al. 2020).

However, the previous arguments as well as the focus of this article relies on the crucial assumption that unemployment represented by unemployment benefits is in general involuntary and not driven by individual choice. This assumption is based on several arguments, which are briefly outlined in the following. First, in Germany unemployment benefit corresponds to 60% of the last wage (67% if children are living in the same household) and implies a massive deterioration of the income situation. In addition, this deterioration hits vulnerable groups most severely, as they usually earn lower wages and are therefore particularly dependent on their income.⁷ Benefits paid from the UA system are even lower and represent a living minimum, which strengthens the argument of periods of involuntary unemployment on the part of the employee and temporary layoffs on the part of the firm.

Second, the approach of identification through unemployment benefits reduces the likelihood of voluntary unemployment, as unemployment for voluntary reasons is a violation of the insurance conditions in the German unemployment benefit system. Voluntary unemployment, e.g. due to termination of employment by the worker and not by the firm, is penalized with a period of unemployment benefit suspension lasting up to 12 weeks (*Sperrzeit*). Such cases in which unemployment benefit receipt in the first 30 days after the end of an employment spell is missing, are not considered in my analysis, as these workers might be affected by benefit suspension due to voluntary contract termination.⁸ The same applies to cases with a spell of non-employment between two employment spells, because the reason for this status is unclear.

Third, analyzing unemployed workers in Germany in a panel setting, Chadi (2010) provides evidence indicating that only a minority of unemployed individuals can be regarded as voluntarily unemployed. This finding is strengthened by DellaVigna et al. (2020), who do not find any evidence of unemployed workers timing their job start to coincide with the end of unemployment benefit entitlement. I thus assume that the crucial assumption of involuntary unemployment is justified by the previous arguments and that there is no distortion in unemployment duration, as workers do not try to delay the start of their employment.

Footnote 6 (continued)

tion and do not fit into my research design of undesired temporary recalls that externalize firm costs since these workers do not receive unemployment benefits.

⁷ In this respect, I assume that workers who are affected by frequent seasonal work and are therefore aware of the consequence of temporary layoffs are unemployed involuntarily as well, as this is also associated with a loss of income.

⁸ The results are also robust and very similar for 45 and 60 days of non-employment and non-benefit periods between the end of employment and the beginning of unemployment benefit payments. This threshold is in line with Nekoei and Weber (2020), who chose 40 days as the threshold.

3 Data

I use two linked administrative data sets: The Sample of Integrated Labour Market Biographies (SIAB) and the Establishment History Panel (BHP). The SIAB is a 2% random sample drawn from the Integrated Employment Biographies (IEB) provided by the Institute for Employment Research (IAB). These data cover individual wages, nationality, age, education, gender, unique establishment identifier, daily employment and unemployment benefit spells among others. The information is available for the employment biographies of employees covered by social security in Germany for the years 1975–2017 (SIAB 7517). As the data are derived from administrative records, they are highly valid in terms of employment and unemployment benefit spells, which is necessary for identifying temporary layoffs and recalls.

However, the SIAB does not contain any information on the self-employed or civil servants. Although employees covered by social security account for over 80% of the German workforce, the data may show shortcomings with regard to periods of non-employment, which are relevant for this analysis. Accordingly, these periods of non-employment may cover periods of self-employment or military service, which can be misinterpreted as temporary layoffs and rehires, which emphasizes the need for the identification strategy described above that focuses on unemployment benefits.

In order to take into consideration additional information on firms, I merge data from the second administrative data set (BHP) via the unique establishment identifier. These data contain information on the median wage in the establishment, establishment size, industry sector, share of high-skilled workers, regional location or share of workers with fixed-term contracts in the establishment. Especially the extensive information on firms makes it possible to identify firms and firm variables that are related to temporary layoffs and recalls, which permits novel insights into the topic. It should be taken into account here, however, that the BHP provides establishment-specific information as of June 30 of each year, meaning that variation within the year cannot be considered. Nevertheless, changes in establishment variables usually tend to be small, especially in larger establishments, so that changes during the year are negligible.

3.1 Data preparation and sample construction

In order to analyze the data provided by the IAB, various preparation steps are required that affect the results. I describe the most important steps of my data preparation and sample construction below. In preparing the data, I try to follow the literature mentioned in the introduction as far as possible. Alternative preparations for sensitivity analyses are described separately.

For my analysis, I use the period 2012–2017. This is because information on whether a fixed-term contract is used or not is only available in the data from 2012 onwards. However, in order to prepare the individual workers' employment biographies, which are necessary for information such as labor market experience or firm

tenure, I use information from the years 1978 to 2017, because the data recorded before 1978 are incomplete. Since the data include every employment spell reported in the period mentioned for the individuals of interest, I make use of actual observed work experience. In the case of overlapping employment spells, I retain the longest spell, and in the case of equal length, I retain the spell with the highest wage. Focusing first on the longest spells enables me to better identify transitions from employment to unemployment and is thus necessary for the research question.

Concerning potential missing values in the data, especially in the education variable, I apply an imputation following Fitzenberger et al. (2005). In addition, I use the wage imputation based on Card et al. (2013) to impute wages above the social security contribution assessment ceiling and conduct an inflation adjustment for wages.

As is often the case in the literature, I consider women in a separate analysis as their employment biographies often change because of parenting. This means that voluntary reasons for temporary layoffs may affect more women than men. Furthermore, women are distributed across jobs differently compared to men, which makes it necessary to analyze them separately, as some occupations have particularly high recall rates. With regard to age restrictions, I examine individuals between the age of 25 and 60.

Like Mavromaras and Rudolph (1998) and Mavromaras and Orme (2004), I restrict the employment spells to regular employment subject to social security contributions, which leads to a noticeable reduction in the number of recalls. This approach is consistent with the topic of interest as marginal part-time employment (which is not subject to social security contributions) is not very specific in terms of tasks and therefore does not require much firm-internal knowledge, which becomes more relevant for regular employment. Therefore, in regular employment, particularly employers have an interest in recalls as they can benefit from workers experience and firm-specific knowledge.

Another important aspect of my sample construction is the consideration of employed workers in regular employment receiving wage top-up benefits at the same time (*Aufstocker*). Such cases occur if workers earn wages below a certain threshold which are therefore topped up with benefits from UA. This happens, for instance, in families where only one parent is in employment and earns a wage that is not sufficient for the family. In these cases, there are employment spells that are parallel to spells of benefit receipt. I exclude such cases from my analysis, as such workers are not solely dependent on their employment relationship and this may affect the duration of unemployment benefit receipt as well as the employment contract type.⁹

With regard to the data preparation for the survival time analysis, I merge employment spells with the same establishment identifier, creating coherent employment spells that are exact to the day for employees. The same applies for spells of unemployment benefits, which I merge for the observed individuals, creating coherent unemployment spells consisting of unemployment assistance and unemployment benefit spells. When merging these spells, I allow interruptions of up to 30 days.

⁹ The exclusion of these workers does not affect the results in a noteworthy manner as they are only a small minority of recalled individuals.

Interruptions lasting more than 30 days lead to a new episode, because in this case, for example, self-employment or internships are possible. Furthermore, I copy any relevant information from the observed employment spells into subsequent and previous unemployment spells, which yields information on such issues as wages before and after unemployment.

As a result of the data preparation, the only unemployment spells that remain for the survival time analysis are those which either lead to employment in a new firm, previous firm and are censored. I censor unemployment spells lasting until 31.12.2017, the last day of observation. Further, unemployment spells with no employment after and spells with a duration exceeding 36 months are censored as well and are considered in the analysis.¹⁰

Moreover, I drop unemployment spells that are not preceded by regular employment. Further, I consider only unemployment spells with a minimum duration of 14 days.¹¹ Therefore, I identify temporary layoffs if the unique establishment identifier matches before and after unemployment, corresponding to an ex-post identification. This approach is in line with the mentioned literature, because no ex-ante information on recalls is usually available. However, this lack of ex-ante information may result in possible biases, as is discussed by Nekoei and Weber (2015). According to these authors, workers who expect to be rehired by their former employer might exhibit lower job-search intensity. This argument has limitations, however. First, the authors show that firms by no means rehire all the workers who expect to be recalled, which implies that this expectation is subject to considerable uncertainty (Nekoei and Weber 2015, 2020). Second, many variables that are important for the quantitative analysis are not affected by the argument, such as firm-related characteristics like industry sector or job-specific information, which are relevant for my analysis.

4 Summary statistics

After applying the above-mentioned preparation steps, I obtain 64,847 observations with a total unemployment duration for the analysis of about 26,991 years for the period 2012–2017. Table 1 provides information on key variables used for the analysis. This information is shown for the entire sample, for both recalls and workers who find employment in a new firm (New Firm). Censored observations are therefore not included in Table 1 (about 26%).

Table 1 shows that a considerable proportion of all unemployment spells, about 18%, end in employment in the previous firm (recall) and about 56% in a new firm, while the rest remains unemployed in the observation period. The absolute majority of the rehired workers have completed vocational training and are not low-skilled, which is in line with Alba-Ramírez et al. (2007). Moreover, 30% of all recalls

¹⁰ According to this restriction, which excludes some outliers, the longest unemployment duration until recall is actually 995 days. Other censoring durations used in the literature are 12, 19, 24, and 36 months.

¹¹ In the literature, different minimum periods of unemployment are used, such as 7, 14, or 30 days.

Table 1 Summary statistics of the sample. *Source* SIAB 7517, own calculation

Variable	Entire sample mean (s.d.)	Recall mean (s.d.)	New firm mean (s.d.)
Share %	100	18.10	55.69
<i>Educ %</i>			
No vocational training	9.77	8.82	9.22
Vocational training	77.48	86.68	77.40
University degree	12.75	4.49	13.39
East Germany %	23.35	30.54	22.48
Migrant %	16.25	14.91	15.24
<i>Age Category %</i>			
25–34	35.71	26.22	39.35
35–44	25.94	24.66	26.65
45–54	26.43	31.89	25.20
55–60	11.91	17.23	8.80
<i>Type of contract %</i>			
Previous fixed-term	30.34	25.89	31.69
Post fixed-term	24.69	23.91	36.57
Previous agency work	21.51	15.99	24.52
<i>Previous Firm size %</i>			
< 10	20.73	28.84	18.19
10–19	13.11	16.54	12.59
20–49	19.33	20.95	19.47
50–99	15.64	13.28	16.70
100–199	13.23	9.63	14.33
200–499	10.46	6.55	11.24
500–999	3.60	1.85	3.76
1000–4999	3.24	2.05	3.15
> 4999	0.66	0.31	0.58
Previous wage €/day	82.22 (60.30)	74.78 (35.07)	81.07 (59.54)
Post wage €/day	57.39 (53.40)	75.85 (35.28)	78.40 (51.13)
Unempl. duration days	152.03 (169.11)	87.89 (76.18)	138.99 (150.55)
Previous tenure firm /day	576.89 (1050.43)	421.38 (607.75)	550.02 (983.29)
Previous emply. in /day	1049.00 (1875.40)	549.34 (923.76)	1092.76 (1846.22)
<i>Source unempl. benef %</i>			
Unemployment Assist	21.96	15.24	21.90
Unemployment Insur	78.04	84.76	78.10
Observations	64.847	11.740	36.113

occur in eastern Germany, although only about 18% of all German employees are employed in eastern Germany in 2018. Thus, there are notable regional difference in recall rates between the eastern and western parts of the country.

Further, larger deviations in the age of recalled workers and in the firm-size structure can be observed. A relatively large proportion of workers over the age of

44 return to their previous firms, while younger workers tend to be employed in a new firm. The same applies to small firms with up to 10 workers, which use more frequent temporary layoffs and recalls, as was found by Mavromaras and Rudolph (1998).

In addition, Table 1 shows that recalled workers are the only workers who do not suffer wage losses after unemployment, which is also discussed by Nekoei and Weber (2020). This finding is explained especially by the firm-specific human capital of recalled workers, which justifies higher wages than those paid to new workers. Further, firms have no additional training costs for recalled workers, making these workers a valuable resource to cover labor demand. Lastly, recalled workers have by far the lowest unemployment duration, as was also found by Nekoei and Weber (2020). This is associated with the lowest negative wage effects in the literature and thus contributes to higher wages for recalled workers (Carrington and Fallick 2017). These findings might further indicate also compensating wage differentials for workers who choose interrupted careers, however this assumption has not yet been confirmed for Germany (Jahn and Pozzoli 2013; Jahn and Bentzen 2012).

5 Estimation and results

The empirical estimation must take into account several possible exits from unemployment, as unemployed workers may (1) return to their previous employer or (2) switch to a new employer. These exits are defined as competing risks in the terminology of survival analysis, since only one of them can happen first. As the exit from unemployment into a previous or a new firm represent different processes, I refer to previous literature and use a competing risk framework.¹² By assuming that the two risks are independent, this econometric framework provides coefficients for both types of risks and thus takes different transition processes explicitly into account.¹³

For the estimation, I use a grouped time proportional hazard model and take unobserved heterogeneity into account. According to this framework, the cause-specific hazard $\theta_{jzt}(X_{jt}, m_{jz})$ —to fail from risk j in period t given that no failure from any cause has yet occurred, considering observed X_{jt} and unobserved heterogeneity m_{jz} can be formalized as:

$$\theta_{jzt}(X_{jt}, m_{jz}) = 1 - \exp \left[-\exp \left(m_{jz} + \beta_{j0} + X_{jt}\beta_j \right) \right]$$

where $j=1$ corresponds to re-employment in the previous firm and $j=2$ employment in a new firm. Moreover, t represents the time interval and takes only positive values, measured in months, and ends in $t=T$ and at risk $j=J$. The spell is censored if the worker is observed in t but not in $t+1$ or if the unemployment spell lasts

¹² This econometric approach is often used in related literature: e.g., Katz and Meyer (1990), Jansson (2002), Böheim (2006), Alba-Ramírez et al. (2007), Nivorozhkin (2008) or Arranz and García-Serrano (2014).

¹³ For this work, I focus on re-employment in previous firms but also provide results for transitions into new firms and a combination of both exits (single risk).

until the end of the observation period. In such censoring cases, the failure from risk j remains 0 and the spell contributes to the likelihood function and the probability of remaining unemployed for the spell duration (Alba-Ramírez et al. 2007). Unobserved heterogeneity m_{jz} enters the equation through two mass points, where the probability of individuals belonging to type z is p_z , which depends on the risk j . Note that unobserved heterogeneity is thus constant across observations for the same individual, which is important for unemployed workers with different spells and exits in the data. I use two mass points to model unobserved heterogeneity, as the information criteria were not improved by using more mass points.¹⁴ The approach of using discrete unobserved heterogeneity in the form of mass points instead of a parametric distribution has the advantage of not assuming a certain distribution.¹⁵ Furthermore, with regard to the specification of baseline hazards, I chose a piecewise constant specification. This approach is not restricted to a certain parametric specification and is thus particularly flexible. The estimated coefficients α_j are of particular interest in the equation. They are provided in the usual proportional hazard manner, where positive coefficients indicate an increase in the hazard rate, while negative coefficients represent a decrease in the hazards.

The results of the estimations are presented in Tables 2 and 3. Beside the results for the competing risks, I present estimation results for the single risk model used as a reference. In order to keep the discussion of the results concise and straightforward, I restrict it to the results for recalls and the main variable.

In general, the results show large disparities between different types of unemployment transitions, which indicate different routes out of unemployment. However, the duration variables reveal quite similar unemployment duration effects on the hazard of the single risks, which is also found by Böheim (2006) for Austria.

With regard to education, the results show the highest recall probabilities for workers without valid vocational training. This finding contradicts the theoretical model developed by Rodríguez-Planas (2014), according to which workers with the highest productivity levels are likely to be recalled more often, as the firm is interested in these high productivity levels. Thus, my results indicate that low-skilled workers are more likely to experience recalls than high-skilled workers. Similar applies to older workers (55–60) and migrants. This finding might indicate that these groups have fewer employment opportunities, which may be a topic further research.

Relevant results are further shown for firm tenure and establishment size. According to these findings, the probability of a recall is highest for workers with longer firm tenure and in smaller establishments. The former finding may point to the implicit contract theory mentioned in the literature. Workers with longer firm tenure and thus a special relationship of trust with the firm know that they can expect to

¹⁴ I used the Akaike (AIC) and the Bayesian information criterion (BIC). Two mass points are also enough to model unobserved heterogeneity according to similar studies (Böheim (2006); Arranz and García-Serrano (2014)).

¹⁵ Alba-Ramírez et al. (2007) and Böheim (2006) discuss this issue in more detail. However, I also estimated continuous time models using Weibull distributed baseline hazards and considered unobserved heterogeneity by means of several assumptions of frailty, which did not lead to any noteworthy changes in the results (results available upon request).

Table 2 Estimation results I/II

Variable	Recall	New firm	Single risk
<i>Education</i>			
No vocational training	(–)	(–)	(–)
Vocational training	–0.188*** (0.056)	0.029 (0.027)	–0.019 (0.024)
University degree	–0.327*** (0.094)	0.168*** (0.035)	0.094*** (0.032)
<i>Task level</i>			
Auxiliary activity	(–)	(–)	(–)
Trained clerk	0.007 (0.039)	0.032 (0.020)	0.035** (0.017)
Specialist/expert	–0.023 (0.088)	0.015 (0.033)	0.020 (0.030)
Previous empl. in years	–0.035*** (0.005)	0.037*** (0.001)	0.025*** (0.001)
<i>Age category</i>			
25–34	(–)	(–)	(–)
35–44	0.098** (0.047)	–0.109*** (0.020)	–0.079*** (0.019)
45–54	0.090* (0.053)	–0.265*** (0.025)	–0.208*** (0.022)
55–60	0.477*** (0.058)	–0.293*** (0.031)	–0.115*** (0.027)
<i>Firm tenure in years</i>			
1–2	(–)	(–)	(–)
2–5	0.739*** (0.041)	–0.159*** (0.019)	0.009 (0.017)
5–10	0.866*** (0.048)	–0.367*** (0.028)	–0.076*** (0.024)
10–15	0.925*** (0.065)	–0.555*** (0.047)	–0.151*** (0.037)
15–20	0.900*** (0.082)	–0.710*** (0.070)	–0.215*** (0.052)
> 20	1.034*** (0.090)	–0.839*** (0.080)	–0.225*** (0.059)
Wage difference	0.198*** (0.047)	0.134*** (0.019)	0.155*** (0.017)
<i>Contract type</i>			
Previous fixed-term	0.117*** (0.042)	–0.084*** (0.017)	–0.052*** (0.016)
Post fixed-term	–0.435*** (0.041)	0.059*** (0.015)	–0.026* (0.014)
Migrant	0.177*** (0.050)	0.097*** (0.022)	0.116*** (0.021)
<i>Firm size</i>			
< 10	(–)	(–)	(–)
10–19	0.010 (0.046)	–0.004 (0.025)	0.005 (0.022)
20–49	–0.106** (0.045)	–0.055** (0.023)	–0.058*** (0.021)
50–99	–0.182*** (0.053)	–0.066*** (0.025)	–0.084*** (0.023)
100–199	–0.164*** (0.059)	–0.042 (0.026)	–0.064*** (0.024)
200–499	–0.081 (0.067)	–0.044 (0.028)	–0.054** (0.026)
500–999	–0.235** (0.116)	0.001 (0.040)	–0.035 (0.038)
1000–4999	0.212** (0.102)	–0.015 (0.043)	0.013 (0.040)
> 5000	0.658*** (0.210)	0.057 (0.087)	0.093 (0.081)
<i>Unobserved heterogeneity</i>			
Probability of type 1	0.804	0.806	0.836
Probability of type 2	0.196	0.194	0.164
Log-likelihood	–16.969.104	–56.647.086	–63.233.688

Table 3 Estimation results II/II

Variable	Recall	New firm	Single risk
<i>Duration in months</i>			
< 1	(–)	(–)	(–)
2	–0.767*** (0.041)	–0.992*** (0.022)	–1.011*** (0.019)
3	–1.265*** (0.044)	–1.483*** (0.024)	–1.508*** (0.021)
4	–1.769*** (0.055)	–1.719*** (0.027)	–1.818*** (0.024)
5	–2.096*** (0.071)	–1.895*** (0.030)	–2.025*** (0.028)
6	–2.434*** (0.090)	–1.980*** (0.032)	–2.141*** (0.030)
6–12	–3.050*** (0.070)	–2.347*** (0.023)	–2.533*** (0.022)
12–18	–3.996*** (0.158)	–2.717*** (0.039)	–2.960*** (0.038)
18–24	–4.404*** (0.254)	–3.043*** (0.062)	–3.294*** (0.060)
24–36	–4.593*** (0.254)	–3.294*** (0.061)	–3.529*** (0.059)
<i>Industries</i>			
Agricult., forestry, fish	(–)	(–)	(–)
Food and beverage	–0.071 (0.155)	0.335*** (0.071)	0.204*** (0.063)
Consumer goods	–0.530*** (0.201)	0.319*** (0.072)	0.155** (0.065)
Production goods	–0.071 (0.091)	0.222*** (0.055)	0.131*** (0.046)
Capital/utility goods	–0.615*** (0.130)	0.319*** (0.056)	0.164*** (0.049)
Construction	0.234*** (0.080)	–0.095* (0.053)	0.022 (0.044)
Hotels/restaurants	–0.156* (0.085)	0.189*** (0.051)	0.077* (0.043)
Transport and logistic	–0.084 (0.081)	0.133*** (0.050)	0.046 (0.042)
Education/teaching	0.290** (0.114)	0.242*** (0.061)	0.191*** (0.053)
<i>Occupations</i>			
Agriculture	(–)	(–)	(–)
Simple manual	–0.023 (0.086)	0.316*** (0.063)	0.135*** (0.050)
Trained manual	–0.086 (0.088)	0.328*** (0.064)	0.123** (0.050)
Technician	–0.589*** (0.161)	0.624*** (0.073)	0.322*** (0.062)
Engineer	–0.631*** (0.196)	0.638*** (0.079)	0.333*** (0.068)
Simple service	–0.103 (0.087)	0.430*** (0.062)	0.211*** (0.049)
Skilled service	–0.249 (0.158)	–0.025 (0.085)	–0.231*** (0.073)
Semi professional	–0.377** (0.179)	0.577*** (0.083)	0.319*** (0.071)
Professionals	–0.848*** (0.235)	0.759*** (0.089)	0.425*** (0.079)
Simple commercial	–0.571*** (0.137)	0.531*** (0.070)	0.249*** (0.057)
Skilled commercial	–0.793*** (0.128)	0.622*** (0.066)	0.329*** (0.054)
Manager	–1.022*** (0.218)	0.605*** (0.076)	0.315*** (0.065)

Further, the models include dummies for entry quarters of unemployment to control for seasonal effects, a categorical variable for labor market experience, source of last unemployment benefits (UI/UA). It also includes regional FE based on NUTS-1 regions. Occupational classifications are based on Blossfeld-Occupations according to Schimpl-Neimanns (2003), industry classifications created according to Eberle et al. (2011). Wage difference is defined as the difference between log daily wage in post minus previous employment, (–) represents reference category, *10%, **5%, ***1%, cluster robust s. e. for person id in ()

be rehired when the firm's situation improves. At the same time, workers with long firm tenure might possess particularly valuable firm-specific human capital, which also increases their likelihood of being recalled (Nekoei and Weber 2020). The latter is also indicated by the finding that recalled workers do not suffer wage losses (Table 1), which can be related to their valuable firm-specific knowledge. With regard to establishment size, the coefficients largely confirm the results obtained by Mavromaras and Rudolph (1998) for Germany: workers in small establishments tend to be recalled more often. The authors explain these findings by the common absence of works councils in smaller establishments, as is also discussed and shown by Liebig and Hense (2007). However, it is noteworthy that the largest establishments have larger recall hazards as well. Nevertheless, these results are at odds with the results obtained by Arranz and García-Serrano (2014), who find clearly increasing recall hazards for larger firms in Spain.

Turning to the main variables of interest, the type of contract, the coefficient for a fixed-term contract in previous employment provides strong and distinct evidence of a higher probability of being recalled.¹⁶ Accordingly, workers who had previously worked in fixed-term contracts are recalled more often than workers who previously worked in permanent contracts. This important finding is discussed in more detail below. Such results with regard to fixed-term contracts are also provided for Spain by Alba-Ramirez et al. (2007) and Arranz and García-Serrano (2014). The coefficient for post fixed-term contract, temporary employment contract after unemployment, suggests a strong negative relation with regard for being recalled. Thus, recalled workers tend to be rehired on permanent contracts, which is consistent with the legal regulations mentioned previously that prohibit successive fixed-term contracts.¹⁷ Additional analyses for unemployment periods lasting more than 4 months, which interrupt the factual context of the job and which is a necessary condition for further employment in fixed-term contracts, show a negative coefficient for post fixed-term contracts as well (results not shown). Thus, there is no evidence of firms systematically laying off workers for more than 4 months in order to re-employ them on fixed-term contracts again.

Regarding unobserved heterogeneity, the estimation shows that about 20% of all employees belong to type 2. Thus, about 20% of the workers in the sample are recalled sooner than the other 80% due to unobserved heterogeneity.

In terms of occupations and industries, despite different definitions in the literature, my results largely coincide with the findings obtained by Böheim (2006) for Austria and by Edler et al. (2019) and Liebig and Hense (2007) for Germany. Occupations and industries in the construction and agricultural sectors use temporary lay-offs more often and recall their workers after unemployment. Remarkably, workers

¹⁶ Having a fixed-term contract in a previous employment period increases the hazard of being recalled by roughly 12% ($\exp(0.115)$).

¹⁷ The average unemployment duration for recalled workers is about 90 days (Table 1). This is not enough to interrupt the factual context and to justify a new fixed-term contract, given that the worker was employed for two years.

in the education sector exhibit the highest coefficients for being recalled, which was not discussed in previous studies for Germany.

6 Discussion and additional analyses

The model I use for the main analysis generally yields robust results that are not altered in any noteworthy manner by recoding variables or including other information. This applies in particular to regional information such as population density, the regional unemployment rate in post-employment relation or different information on wages. Furthermore, the results obtained are not changed by including information about whether a worker was previously employed by a temporary work agency.¹⁸ The same applies for adding further firm-specific information, such as the share of low- or high-skilled workers in the firm or the share of workers employed on fixed-term contracts or hired from an agency, which does not yield new insights or clear effects on recall hazards. Accordingly, establishment size and industry indicators sufficiently capture firm effects.

In order to extend the analysis and discussion on one of the main findings, the interplay between fixed-term contracts and recalls, I conduct two additional estimations. I omit the indicator for post fixed-term contract and estimate the model shown in the first column (recalls) of Tables 2 and 3 for unemployed workers who take up employment on (1) a fixed-term contract or (2) a permanent contract, both in their previous firms (recalls). The results are provided in Appendix 1. The results reveal that workers who were recalled into fixed-term employment were employed considerably more often on fixed-term contracts before becoming unemployed. In contrast, workers, who were recalled into permanent jobs were more likely to have had permanent contracts before their unemployment episode. These findings expand the previous analysis with regard to the contract type, as recalled workers on fixed-term contracts tend to remain on such contracts.

To extend the analysis with regard to the relevance and validity of the results for different groups, I also conduct a separate analysis for women. The results are provided in Appendix 2 and show an even stronger interplay between fixed-term contracts and recalls for women than for men. Although any differences in the distribution within occupations and industries are controlled for, unemployed women are more likely to be recalled by former employers after a period of fixed-term employment. At the same time, the coefficient for post fixed-term employment for women shows that women are less likely than men to be recalled on permanent contracts. Thus, the results and the picture of the analysis remain the same for the main variables.

¹⁸ Unfortunately, the data do not contain any information on the hiring firm of workers employed by an agency.

6.1 Seasonal and business cycle recalls

The distinction between seasonal and business cycle recalls is a relevant aspect, but one that is frequently neglected due to insufficient data possibilities. The seasonal cycle is the most important driver: Seasonal effects, such as weather, impacts firms' labor demand. Second, the business cycle is influenced by longer-term trends and also affects the labor demand. Since these two factors result in different dynamics and processes of unemployment and recalls, it is important to examine them separately.

I define seasonal recalls following Mavromaras and Rudolph (1995), taking into account only unemployment periods lasting up to 4 months.¹⁹ Furthermore, the previous employment period must be between 6 and 12 months in duration. This approach makes it possible to identify cases that are subject to repeated seasonal fluctuations, such as the construction sector. Business cycle recalls are identified in line with Mavromaras and Rudolph (1995) and Liebig and Hense (2007) and require not only an unemployment duration of at least 4 months but also a previous employment of at least 12 months.²⁰ The results are shown in Appendix 3 and provide a variety of relevant insights. The coefficients for fixed-term employment reveal that the relationship between fixed-term contracts, unemployment and recalls is driven by seasonal fluctuations. Business cycle recalls on the other hand, tend to affect permanent employees, reflecting layoffs for operational reasons and recalls when the affected firm recovers. This is also substantiated by the very large negative coefficient for post fixed-term contracts for business cycle recalls, according to which workers are usually rehired on permanent contracts. These results thus confirm and specify the previous findings by emphasizing seasonal effects on rehires.

7 Conclusion

This analysis has shown the relevance and contribution of temporary layoffs not only for the unemployment dynamics but also for firms in Germany. Although temporary layoffs are an undesirable tool from the perspective of employment policy and are intended to be prevented by different instruments such as statutory regulations, the data indicate that about one fifth of all unemployed workers return to their previous employer. Further, the results show that temporary layoffs are predominantly driven by seasonal fluctuations. However, temporary layoffs are unequally distributed across industries, occupations, and demographic characteristics.

Using a grouped time model, my results show that older workers and workers without vocational qualifications are affected considerably more often by temporary layoffs. The same applies for workers with high levels of firm tenure,

¹⁹ Since I define a month with 30 days, but in fact, months with 31 days are in the data as well, I choose a maximum duration of 124 days in order not to lose these cases.

²⁰ I approximate the unemployment duration based on the time in benefit reception, as in the main analysis.

which is in line with previous considerations related to firm-specific human capital. Further, my results show no clear patterns of recall rates with regard to firm size, as the smallest and the largest firms yield the largest coefficients for recalls. However, clear patterns of considerably higher recall rates are found for migrants and women. These groups are more frequently affected by temporary layoffs and rehiring.

Furthermore, my results confirm previous findings in the literature with regard to certain occupations that are especially affected by temporary layoffs. These include agriculture, service and manual related occupations. The same applies to certain industries that use recalls considerably more often, such as the agriculture, food and beverage, production goods/manufacturing and particularly education. With regard to education, which was not yet considered by the literature, this is a new trend on the German labor market, with teachers being laid off during vacations and rehired afterwards. One of the reasons for this finding is the use of fixed-term contracts.

I provide evidence of an interplay between fixed-term employment contracts and recalls, which had previously not been shown for Germany. Accordingly, workers with fixed-term contracts are more frequently laid off and recalled compared to workers with permanent contracts. Further analyses indicate that recalled employees working on fixed-term contracts, tend to have been in fixed-term employment previously as well. Thus, this finding points to the fact that recalled workers with fixed-term contracts tend to remain in fixed-term employment. However, regarding the strategies pursued by firms, my results provide no evidence of a systematically layoff above 4 months in order to rehire workers in fixed-term contracts again. This is also confirmed with regard to employment contracts after temporary layoffs, which tend to be permanent contracts.

As temporary layoffs constitute a considerable element of unemployment dynamics in Germany and may have negative effects on individuals and on the sustainability of the unemployment benefit and social security system, policy measures should aim to reduce such negative effects. One way is to implement measures similar to the experience rating system in the U.S., which penalizes firms with higher UI tax rates according to their layoff history (Albertini et al. 2020). This measure not only promises a stabilizing effect but also includes the externalities of temporary layoffs. Further, with respect to the interplay between recalls and fixed-term contracts, it may be useful to consider additional restrictions to reduce loops of temporary layoffs and fixed-term contracts. These measures do not affect firms' flexibility, as they still have the possibility to hire workers from agencies in order to cope with fluctuations. In addition, firms in Germany experiencing significant declines in business activity can apply for (seasonal) short-time work.

Appendix 1

See Tables 4 and 5.

Table 4 Recall estimations for workers in temporary and permanent contracts after unemployment I/II

Variable	Post temporary employment	Post permanent employment
<i>Education</i>		
No Vocational training	(–)	(–)
Vocational training	– 0.136 (0.120)	– 0.212*** (0.064)
University degree	0.063 (0.165)	– 0.553*** (0.117)
<i>Task level</i>		
Auxiliary activity	(–)	(–)
Trained clerk	0.129 (0.084)	– 0.057 (0.044)
Specialist/expert	0.148 (0.152)	– 0.236** (0.112)
Previous empl. in years	– 0.046*** (0.015)	– 0.022*** (0.005)
<i>Age category</i>		
25–34	(–)	(–)
35–44	– 0.002 (0.097)	0.100* (0.055)
45–54	– 0.074 (0.112)	0.081 (0.061)
55–60	0.322** (0.127)	0.448*** (0.066)
<i>Firm tenure in years</i>		
1–2	(–)	(–)
2–5	0.627*** (0.084)	0.662*** (0.046)
5–10	0.711*** (0.118)	0.774*** (0.053)
10–15	0.750*** (0.193)	0.820*** (0.070)
15–20	0.318 (0.242)	0.827*** (0.089)
> 20	0.730** (0.355)	0.938*** (0.095)
Wage difference	0.222** (0.095)	0.212*** (0.056)
<i>Contract type</i>		
Previous fixed-term	2.229*** (0.120)	– 1.064*** (0.077)
Migrant	0.115 (0.106)	0.209*** (0.058)
<i>Firm size</i>		
< 10	(–)	(–)
10–19	0.183 (0.123)	– 0.014 (0.050)
20–49	– 0.076 (0.115)	– 0.110** (0.049)
50–99	– 0.039 (0.123)	– 0.183*** (0.060)
100–199	– 0.080 (0.130)	– 0.141** (0.067)
200–499	0.217* (0.132)	– 0.160** (0.081)
500–999	0.017 (0.198)	– 0.227 (0.149)
1000–4999	0.321* (0.164)	0.172 (0.143)
> 5000	0.812*** (0.311)	0.868*** (0.286)
<i>Unobserved heterogeneity</i>		
Probability of type 1	0.774	0.813
Probability of type 2	0.226	0.187
Log-likelihood	– 3.752.720	– 12.670.962

*10%, **5%, ***1%

Table 5 Recall estimations for workers in temporary and permanent contracts after unemployment II/II

Variable	Post temporary employment	Post permanent employment
<i>Duration in months</i>		
< 1	(–)	(–)
2	–0.735*** (0.096)	–0.802*** (0.046)
3	–1.164*** (0.101)	–1.325*** (0.050)
4	–1.770*** (0.125)	–1.785*** (0.062)
5	–1.873*** (0.140)	–2.155*** (0.083)
6	–2.250*** (0.171)	–2.442*** (0.106)
6–12	–2.942*** (0.142)	–3.012*** (0.082)
12–18	–4.059*** (0.365)	–3.847*** (0.175)
18–24	–3.989*** (0.420)	–4.393*** (0.320)
24–36	–4.348*** (0.509)	–4.462*** (0.293)
<i>Industries</i>		
Agricult., forestry, fish	(–)	(–)
Food and beverage	–0.041 (0.236)	–0.427* (0.236)
Consumer goods	–0.003 (0.319)	–0.757*** (0.265)
Production goods	–0.328 (0.203)	–0.027 (0.103)
Capital/utility goods	–1.186*** (0.300)	–0.409*** (0.145)
Construction	0.134 (0.175)	0.206** (0.091)
Hotels/restaurants	–0.140 (0.163)	–0.237** (0.101)
Transport and logistic	–0.273* (0.166)	–0.023 (0.094)
Education/teaching	0.275 (0.182)	0.053 (0.168)
<i>Occupations</i>		
Agriculture	(–)	(–)
Simple manual	0.051 (0.166)	0.036 (0.101)
Trained manual	–0.051 (0.174)	–0.004 (0.103)
Technician	–0.361 (0.314)	–0.431** (0.189)
Engineer	–0.528 (0.358)	–0.411* (0.235)
Simple Service	–0.256 (0.161)	0.042 (0.104)
Skilled Service	–0.938*** (0.252)	0.085 (0.218)
Semi professional	–0.363 (0.266)	–0.264 (0.261)
Professionals	–0.746** (0.326)	–0.986** (0.422)
Simple commercial	–0.652** (0.262)	–0.310* (0.163)
Skilled commercial	–0.635*** (0.235)	–0.640*** (0.154)
Manager	–1.209** (0.543)	–0.730*** (0.245)

Further, the models include dummies for entry quarters of unemployment to control for seasonal effects, a categorical variable for labor market experience, source of last unemployment benefits (UI/UA). It also includes regional FE based on NUTS-1 regions. Occupational classifications are based on Blossfeld-Occupations according to Schimpl-Neimanns (2003), industry classifications created according to Eberle et al. (2011). Wage difference is defined as the difference between log daily wage in post minus previous employment, (–) represents reference category, *10%, **5%, ***1%, cluster robust s. e. for person id in ()

Appendix 2

See Tables 6 and 7.

Table 6 Estimation results for women I/II

Variable	Recall	New firm	Single risk
<i>Education</i>			
No Vocational training	(–)	(–)	(–)
Vocational training	–0.147 (0.098)	0.123** (0.049)	0.066 (0.044)
University degree	–0.285** (0.130)	0.140** (0.055)	0.069 (0.050)
<i>Task level</i>			
Auxiliary activity	(–)	(–)	(–)
Trained clerk	–0.061 (0.077)	0.158*** (0.040)	0.111*** (0.036)
Specialist/expert	–0.275** (0.122)	0.170*** (0.050)	0.104** (0.046)
Previous empl. in years	–0.064*** (0.010)	0.034*** (0.002)	0.024*** (0.002)
<i>Age category</i>			
25–34	(–)	(–)	(–)
35–44	0.179** (0.088)	–0.209*** (0.034)	–0.162*** (0.032)
45–54	0.070 (0.094)	–0.363*** (0.039)	–0.310*** (0.036)
55–60	0.600*** (0.110)	–0.506*** (0.055)	–0.270*** (0.049)
<i>Firm tenure in years</i>			
1–2	(–)	(–)	(–)
2–5	0.674*** (0.074)	–0.145*** (0.030)	–0.023 (0.028)
5–10	0.855*** (0.095)	–0.281*** (0.046)	–0.003239
10–15	1.072*** (0.136)	–0.407*** (0.075)	–0.008052
15–20	0.707*** (0.217)	–0.521*** (0.115)	–0.314*** (0.102)
> 20	1.642*** (0.248)	–0.448*** (0.152)	–0.043 (0.130)
Wage difference	0.004 (0.083)	0.124*** (0.032)	0.115*** (0.030)
<i>Contract type</i>			
Previous fixed-term	0.273*** (0.067)	–0.153*** (0.027)	–0.083*** (0.025)
Post fixed-term	–0.349*** (0.064)	–0.067*** (0.024)	–0.113*** (0.023)
Migrant	0.225** (0.096)	0.027 (0.041)	0.068* (0.038)
<i>Firm size</i>			
< 10	(–)	(–)	(–)
10–19	–0.115 (0.103)	–0.035 (0.043)	–0.035 (0.040)
20–49	–0.068 (0.097)	0.023 (0.039)	0.013 (0.036)
50–99	–0.176 (0.110)	0.022 (0.042)	–0.021 (0.039)
100–199	–0.005 (0.109)	0.054 (0.043)	0.044 (0.040)
200–499	–0.143 (0.119)	0.005 (0.045)	–0.034 (0.042)
500–999	–0.188 (0.166)	–0.004 (0.059)	–0.033 (0.056)
1000–4999	0.164 (0.143)	–0.178*** (0.063)	–0.131** (0.058)
> 5000	0.955*** (0.260)	–0.148 (0.127)	0.003 (0.114)
<i>Unobserved heterogeneity</i>			
Probability of type 1	0.717	0.843	0.864
Probability of type 2	0.283	0.157	0.136
Log-likelihood	–4,970,385	–18,863,815	–20453.913

*10%, **5%, ***1%

Table 7 Estimation results for Women II/II

Variable	Recall	New Firm	Single risk
<i>Duration in months</i>			
< 1	(–)	(–)	(–)
2	– 0.724*** (0.082)	– 0.984*** (0.035)	– 1.027*** (0.032)
3	– 1.270*** (0.091)	– 1.500*** (0.039)	– 1.554*** (0.036)
4	– 1.655*** (0.104)	– 1.809*** (0.044)	– 1.888*** (0.041)
5	– 1.911*** (0.119)	– 1.997*** (0.049)	– 2.085*** (0.046)
6	– 2.312*** (0.157)	– 2.156*** (0.054)	– 2.286*** (0.052)
6–12	– 2.756*** (0.115)	– 2.449*** (0.037)	– 2.599*** (0.035)
12–18	– 3.069*** (0.196)	– 2.914*** (0.074)	– 3.088*** (0.069)
18–24	– 3.889*** (0.362)	– 3.195*** (0.114)	– 3.448*** (0.108)
24–36	– 4.483*** (0.455)	– 3.348*** (0.120)	– 3.619*** (0.116)
<i>Industries</i>			
Agricult., forestry, fish	(–)	(–)	(–)
Food and beverage	0.021 (0.216)	0.033 (0.130)	0.038 (0.109)
Consumer goods	– 0.305 (0.273)	0.211 (0.131)	0.071 (0.114)
Production goods	– 0.274 (0.240)	0.333*** (0.120)	0.184* (0.104)
Capital/utility goods	– 0.667** (0.268)	0.403*** (0.118)	0.224** (0.101)
Construction	0.451* (0.252)	0.142 (0.137)	0.104 (0.119)
Hotels/restaurants	0.052 (0.172)	0.128 (0.108)	0.054 (0.090)
Transport and logistic	– 0.249 (0.180)	0.278*** (0.107)	0.137 (0.090)
Education/teaching	– 0.056 (0.185)	0.432*** (0.110)	0.297*** (0.092)
<i>Occupations</i>			
Agriculture	(–)	(–)	(–)
Simple manual	0.145 (0.184)	0.343*** (0.124)	0.170* (0.099)
Trained manual	0.116 (0.190)	0.367*** (0.131)	0.222** (0.106)
Technician	– 0.286 (0.289)	0.568*** (0.136)	0.329*** (0.115)
Engineer	– 0.248 (0.357)	0.530*** (0.149)	0.277** (0.128)
Simple service	0.183 (0.167)	0.345*** (0.120)	0.208** (0.095)
Skilled service	0.014 (0.196)	0.245* (0.126)	0.062 (0.102)
Semi professional	0.129 (0.202)	0.441*** (0.126)	0.258** (0.103)
Professionals	0.047 (0.267)	0.552*** (0.136)	0.332*** (0.114)
Simple commercial	– 0.145 (0.184)	0.550*** (0.123)	0.295*** (0.098)
Skilled commercial	– 0.543*** (0.181)	0.521*** (0.119)	0.264*** (0.095)
Manager	– 0.757** (0.318)	0.569*** (0.131)	0.307*** (0.109)

Further, the models include dummies for entry quarters of unemployment to control for seasonal effects, a categorical variable for labor market experience, source of last unemployment benefits (UI/UA). It also includes regional FE based on NUTS-1 regions. Occupational classifications are based on Blossfeld-Occupations according to Schimpl-Neimanns (2003), industry classifications created according to Eberle et al. (2011). Wage difference is defined as the difference between log daily wage in post minus previous employment, (–) represents reference category, *10%, **5%, ***1%, cluster robust s. e. for person id in ()

Appendix 3

See Tables 8 and 9.

Table 8 Seasonal and business cycle recalls I/II

Variable	Season	Business cycle
<i>Education</i>		
No Vocational training	(–)	(–)
Vocational training	0.043 (0.090)	–0.172 (0.147)
University degree	–0.069 (0.161)	–0.374 (0.233)
<i>Task level</i>		
Auxiliary activity	(–)	(–)
Trained clerk	–0.126** (0.055)	–0.001 (0.112)
Specialist/expert	–0.106 (0.139)	–0.397 (0.256)
Previous empl. in years	0.475*** (0.170)	–0.059*** (0.013)
<i>Age category</i>		
25–34	(–)	(–)
35–44	–0.002 (0.072)	0.331*** (0.128)
45–54	–0.027 (0.078)	0.472*** (0.144)
55–60	0.330*** (0.085)	1.014*** (0.164)
<i>Firm tenure in years</i>		
1–2	(–)	(–)
2–5	0.486*** (0.061)	0.351*** (0.104)
5–10	0.442*** (0.068)	0.681*** (0.140)
10–15	0.276*** (0.089)	0.699*** (0.225)
15–20	0.346*** (0.107)	0.566 (0.344)
> 20	0.351*** (0.125)	0.778* (0.419)
Wage difference	0.039 (0.091)	0.457*** (0.120)
<i>Contract type</i>		
Previous fixed-term	0.155** (0.068)	–0.300** (0.124)
Post fixed-term	–0.295*** (0.068)	–0.773*** (0.113)
Migrant	0.127 (0.080)	0.318** (0.126)
<i>Firm size</i>		
< 10	(–)	(–)
10–19	–0.048 (0.065)	–0.002 (0.138)
20–49	–0.071 (0.061)	–0.199 (0.143)
50–99	–0.089 (0.074)	–0.111 (0.157)
100–199	–0.214** (0.089)	–0.377** (0.173)
200–499	–0.042 (0.101)	–0.112 (0.178)
500–999	–0.347 (0.213)	–0.220 (0.269)
1000–4999	0.052 (0.173)	0.436* (0.242)
> 5000	0.694 (0.556)	1.154*** (0.372)
<i>Unobserved heterogeneity</i>		
Probability of type 1	0.770	0.804
Probability of type 2	0.230	0.196
Log-likelihood	–6406.693	–2662.044

*10%, **5%, ***1%

Table 9 Seasonal and business cycle recall II/II

Variable	Season	Business cycle
<i>Duration in months</i>		
< 1	(–)	
2	–0.832*** (0.058)	
3	–1.323*** (0.060)	
4	–1.670*** (0.075)	(–)
5		–0.366** (0.149)
6		–0.856*** (0.165)
6–12		–1.592*** (0.148)
12–18		–2.980*** (0.249)
18–24		–3.840*** (0.443)
24–36		–4.154*** (0.477)
<i>Industries</i>		
Agricult., forestry, fish	(–)	(–)
Food and beverage	0.376* (0.224)	–0.423 (0.443)
Consumer goods	0.242 (0.333)	–0.192 (0.463)
Production goods	0.051 (0.119)	–0.432 (0.314)
Capital/utility goods	–0.513** (0.247)	–1.029*** (0.350)
Construction	0.227** (0.102)	0.063 (0.280)
Hotels/restaurants	–0.037 (0.112)	–0.275 (0.285)
Transport and logistic	0.194* (0.108)	–0.063 (0.271)
Education/teaching	0.489*** (0.168)	0.359 (0.338)
<i>Occupations</i>		
Agriculture	(–)	(–)
Simple manual	0.160 (0.108)	0.295 (0.354)
Trained manual	0.066 (0.112)	0.148 (0.361)
Technician	–0.391 (0.248)	–0.685 (0.538)
Engineer	–0.228072	–0.212 (0.537)
Simple service	–0.091 (0.114)	0.078 (0.353)
Skilled service	0.330 (0.215)	0.094 (0.528)
Semi professional	–0.430 (0.283)	–1.134 (0.698)
Professionals	–0.512688	–0.016 (0.553)
Simple commercial	–0.714*** (0.231)	–0.041 (0.430)
Skilled commercial	–0.752*** (0.229)	–0.348 (0.396)
Manager	–2.640*** (1.014)	–0.428 (0.530)

Further, the models include dummies for entry quarters of unemployment to control for seasonal effects, a categorical variable for labor market experience, source of last unemployment benefits (UI/UA). It also includes regional FE based on NUTS-1 regions. Occupational classifications are based on Blossfeld-Occupations according to Schimpl-Neimanns (2003), industry classifications created according to Eberle et al. (2011). Wage difference is defined as the difference between log daily wage in post minus previous employment, (–) represents reference category, *10%, **5%, ***1%, cluster robust s. e. for person id in ()

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