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How do severance pay and job search assistance jointly affect unemployment duration and job quality?

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Abstract

Many countries require firms to pay severance pay to workers displaced in a mass layoff. Displaced workers often also receive some form of job search assistance. While these may be useful policies on their own, severance pay could undermine job search assistance efforts. Yet, we know very little about the net effects of these policies. This paper uses multistate duration models to examine the joint effects of severance pay and job search assistance on unemployment duration and wages. A unique dataset of social compensation plans that include both severance pay and an offer of job search assistance for each displaced worker is combined with administrative data on employment status of workers in the Netherlands. The effects are identified by comparing workers displaced through a bankruptcy, who don't get any compensation, with workers displaced with a social compensation plan. There are three main findings. First, social compensation plans have a positive effect on the probability to start a new job right after the current job ends. Second, for those who start an unemployment spell, social compensation plans lead to longer unemployment durations. The overall job-finding probability declines. Third, social compensation plans have a negative effect on subsequent job quality in terms of wages.

Keywords: Duration analysis, firm closures, job search assistance, mass layoffs, severance pay, social plans.

JEL codes: J64, J65, J68.

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1 Introduction

With improvements in technology and changes in product demand, firms must be able to adapt their workforce to maintain productivity and enhance growth. While often necessary, such adaptations frequently lead to disruptions of careers and lives. The individual costs of displacement are high, with depreciation of human capital and lost earnings. But while individual layoffs are damaging for individual workers, mass layoffs or plant closures not only hurt the workers workers involved, but also the communities in which they live, where suddenly a large part of the workforce becomes unemployed.

Given these individual and social costs, it is not surprising that governments have implemented different policies to both protect workers from the consequences of layoffs and to support them if they do become unemployed. With the Great Recession hitting labour markets hard in 2009, there has been renewed interest in different ways to deal with both individual and mass layoffs.

A common way to support workers who lose their job is to offer them some form of job search assistance. These programs are aimed at helping unemployed workers find a fitting job quicker than if they had been searching by themselves. Evaluations show that these types of programs are generally quite effective, especially compared to other active labor market policies such as training (Card et al., 2010).

Most countries also have some form of employment protection legislation (EPL) to prevent unemployment and reduce job destruction. EPL forces firms to internalize (part of) the social costs of unemployment. A prominent example is that firms are frequently required to pay a severance payment to displaced workers. There are often additional rules in the case of mass layoffs. For example, one third of OECD countries require firms to establish a social compensation plan in the case of mass layoffs, containing financial measures, but also re-employment measures or sometimes early retirement provisions (OECD, 2013).

While these may seem reasonable policies on their own, they could lead to conflicting incentives for workers and hence to suboptimal outcomes. For instance, financial compensation at the moment of a layoff could conflict with job search assistance. If workers receive a lump-sum payment that could increase to several months or a years' worth of regular earnings, they have a lower incentive to search for a new job right away. This could reduce the effectiveness of job search assistance and lead to longer unemployment durations. Yet, despite the obvious relevance of these interactions, there is no empirical evidence on whether severance pay and job search assistance conflict.

In this paper I estimate the joint effects of job search assistance and severance pay for workers who lost their jobs in a mass layoff. I use a sample of social compensation plans (henceforth social plans) offered to laid off workers in the Netherlands. A social plan is paid for by the firm who has to layoff workers due to economic circumstances and contains

both severance pay for each laid off worker and an offer of job search assistance. Job search assistance is provided by private agencies. The establishment of a social plan is required in many countries, including Germany, France, Denmark and the Netherlands (OECD, 2013).

Estimates of the the effect of programs for dismissed workers are often hampered by various forms of selection bias. First, workers are usually dismissed for a reason, such as bad performance, which introduces selection bias in the sample of dismissed workers. Even if workers lose their job due to cutbacks unrelated to their individual performance, firms often have the discretion to select which workers will be dismissed. Second, if we are interested in the effect of a program on subsequent job quality, the subsample of workers who find a job are a selected sample of those who were looking for a job. Finally, not all workers enter an unemployment spell after they are dismissed. Some find a new job that starts immediately after they lost their current job. This means that all workers who enter an unemployment spell are a selected sample of all dismissed workers as well. I take into account these various forms of selection in the following ways.

First, I use detailed administrative data on workers involved in collective dismissals combined with a unique dataset on social plans offered by firms to these workers in the Netherlands. As a control group I use workers displaced through bankruptcies who don't receive a social plan. The main advantage of using these data is that in both collective dismissals and bankruptcies firms don't have the opportunity to choose which worker will be displaced. This means that there is no selection bias in the initial sample of displaced workers.

Second, I use multistate duration analysis methods to estimate the effect of social plans both on employment probabilities and the quality of the subsequent job. Using these methods instead of regular regression models allow me to control for additional forms of selection bias. For example, some workers find a job before their current employment spell actually ends. This leads to a selected sample of workers who enter unemployment. I explicitly take this selection into account. Selection bias could also result if not all workers find a job. Properly evaluating effects on job quality requires taking this into account. Finally, duration models allow me to control for unobserved heterogeneity in a flexible way.

The identifying assumption is that, conditional upon observed and unobserved heterogeneity, workers displaced through a bankruptcy or through a collective dismissal have similar re-employment opportunities, except that the latter receive a social plan while the former don't. Given the institutional setting and data, this is a plausible assumption. First, the most important parameters of job search - unemployment benefits and the distribution of wage offers - don't depend on the type of layoff. Second, both bankruptcies and collective dismissals are plausibly exogenous from the point of view of the individual worker.

My main findings are that social plans have a positive effect on the probability to start a new job without an intervening unemployment spell, but a negative effect on the unemployment exit rate for those who do enter unemployment. The overall probability to find a job

declines. Furthermore, social plans have a negative effect on the quality of the next job in terms of wages. These results suggest that the positive effect of job search assistance dominates any negative effect severance pay might have for workers when looking for a job during their notice period. But when workers enter an unemployment spell, the negative effects of severance pay dominate any positive effects job search assistance might have. Finally, while displaced workers with a social plan have more time to search for a job because of severance pay and other financial provisions, this extra time doesn't translate into a higher match quality. One explanation for this somewhat puzzling result could be an income effect of severance pay. Workers with severance pay might be taking more leisure and, since I measure monthly wages, this translates into a lower monthly wage.

This study is related to the literature on severance pay. Most papers find that severance pay reduces the probability to find a new job. Card et al. (2007) examine severance pay in Austria and observe that it reduces job-finding rates in the first 20 weeks of unemployment by around 10%. Uusitalo and Verho (2010) also find negative effects of severance pay on the unemployment exit rate by using a Finnish reform. My findings are in line with these studies. This study also contributes to the literature on job search assistance. Card et al. (2010) review the literature on active labour market policies and find that job search assistance programs are quite effective. Most of these programs, however, are run by the public employment service and might therefore be difficult to compare to the private job search assistance programs included in my study. Behaghel et al. (2014) evaluate both public and private job search assistance in France. They find that both increase re-employment opportunities, but that public job search support is more effective. There is no literature that looks at how severance pay might affect job search assistance.

Finally, this paper is related to a large literature on the effect of displacement on employment probabilities and wages. Studies for the U.S. find large wage losses for displaced workers, while European studies show substantially lower employment probabilities, but smaller wage losses (see e.g. Hamermesh (1989) and Jacobsen et al. (1993) on the US and Burda and Mertens (2001); Kuhn (2002); Eliason and Storrie (2006); Hijzen et al. (2010); Huttunen et al. (2011); Deelen et al. (2014) on European countries.). Most of these studies only use workers displaced through firm closures. One exception is Hijzen et al. (2010), who compare workers displaced through mass layoffs and firm closures in the UK. They find that workers displaced through mass layoffs have smaller wage losses than workers displaced through firm closures. This suggests that re-employment opportunities (without social plans) might be better for workers displaced through mass layoffs than for workers displaced through firm closures. Most of these studies use fixed effects panel data techniques to estimate the effects of displacement, but there are some who use duration models (Valletta, 1991; Abbring et al., 2002; Tatsiramos, 2010). However, these papers either don't estimate the effects on job quality (Tatsiramos, 2010) or they don't take into account the dynamic selection into jobs

(Valletta, 1991; Abbring et al., 2002).

This paper contributes to the existing literature in two ways. First, it is the first paper to look at the combined effect of job search assistance and severance pay on re-employment opportunities and job quality. Second, it is as far as I'm aware the first paper that explicitly takes into account that some workers find a new job before their displacement date and evaluates the effect of a program on this outcome.

The finding that social plans reduce re-employment probabilities for displaced workers is of interest to policy makers as well. Many countries require social plans in the case of collective dismissals, but they don't stipulate what kind of arrangements should be in them. For policy makers interested in reducing unemployment durations, it is important to take into account that social plans in their current form could actually lead to longer unemployment durations. A policy measure could be to more clearly state what kind of arrangements should be in social plans to prevent obvious conflicts in incentives, and let the firm and labour unions negotiate on the details.

The remainder of the paper is organised as follows. In section 2 I discuss the role of social plans in employment protection legislation in different OECD countries. I also explain the Dutch institutional context of collective dismissals, bankruptcies and social plans. In section 3 I describe my data and provide some descriptive analyses. In section 4 I present my empirical strategy. In section 5 I discuss the results. In section 6 I check the robustness of my results. I present simulations of the effects of social plans in section 7 and conclude in section 8.

2 Institutional background

About one third of OECD countries require firms to offer a social plan to workers displaced in a mass layoff. This is a part of employment protection legislation (OECD, 2013). Social plans are usually the result of a bargaining process between the firm and representatives from the labour union or worker's council. In most countries social plans contain both financial measures (severance pay) and some form of job search assistance. Another important element of social plans in some countries, including the Netherlands, is an offer of early retirement for older workers. To circumvent problems with early retirement leading to long non-employment durations, I limit my sample to workers between ages 20 and 50.

Figure 1 shows the strictness of EPL related to collective dismissals on a scale from 0 to 6. The OECD average is around 3, and the figure shows that the Netherlands is just above it. A substantial part of the strictness of the Dutch rules relate to "other special costs to employers in the case of collective dismissals", which usually means social plans. The figure shows that the strictness in the Netherlands in this respect is similar to, amongst others, France, Germany, Denmark and Austria.

Since I use data on workers displaced through collective dismissals or bankruptcy in the Netherlands, I will now shortly discuss the Dutch institutions and provide some more detail on the type of job search assistance and the level of severance pay.

2.1 Collective dismissals, bankruptcy and social plans in the Netherlands

Collective dismissals in the Netherlands are defined as dismissing at least twenty workers within a three month period.¹ Collective dismissals are usually for economic reasons. Firms are required to consult the labour union and worker’s council in advance. The stated goal of this consultation is to look for ways in which to lower the number of dismissals. In case that turns out to be impossible, the consultations serves to mitigate the consequences for workers through arrangements described in a social plan.

Unlike some other OECD countries, the Netherlands does not require firms to offer a social plan in the case of collective dismissals. However, firms are required to get the approval of the public employment office, which requires that worker’s representatives (labour unions or the worker’s council) agree with the dismissal. As such, a social plan is a bargaining tool to get unions to agree with the dismissal. The presence of a social plan is usually enough to convince the employment office that the firm has done everything within its means to soften the consequences for the workers involved. Furthermore, if firms still decide to dismiss workers without a social plan, workers can challenge the dismissal in court. The judge will typically allocate a higher severance pay if the firm did not offer any arrangements to its workers.

Similar to many other countries, firms in the Netherlands are not allowed to freely decide who will be displaced in the case of collective dismissals. Instead, they have to follow specific rules. Before 2006, firms had to apply the last-in-first-out (LIFO) rule. The rule requires that within each type of job (e.g. administrative, IT or specific production jobs) those who came in last, will be displaced first. Firms could also choose to apply the LIFO rule within both age groups and type of job.² For example, administrative workers are divided in 10-year age groups (15 - 25, 25 - 35, etc.) and within each group the worker who came in last will be displaced. The most popular choice was to apply the general LIFO rule. However, since March 2006 the second rule has become the norm, which should lead to a more diverse set of workers being displaced.³

Workers can also be displaced in a bankruptcy. In this case the curator of the bankrupt firm has to consult with the labour unions and worker’s council as well, but the firm does not need a displacement permit from the public employment office. As a consequence workers don’t receive any compensation in the form of severance pay or a social plan in the case of

¹I describe the situation before the EPL reform of 2015.

²This is known as the *afspiegelingsbeginsel*, which might be translated as “reflection principle”.

³In the sensitivity analyses I return to this reform and examine whether it affects the results.

a bankruptcy. Any overdue salary, overtime hours and holiday allowances are paid by the public employment office. Workers displaced in a bankruptcy or through a collective dismissal both have access to statutory unemployment benefits.

2.2 Job search assistance and severance pay in social plans

Job search assistance in social plans is offered by private agencies hired by the firm who lays off workers. There are no sanctions if workers don't take up the offer. According to people involved in these programs, the take-up rate is still around 70 - 80%. The program consists in coming to terms with losing your job, trying to figure out what you want to and are able to do, and finally helping you search for the job you want. In the first few weeks of the program, workers might have meetings with a caseworker once or twice a week. When they enter the job searching phase, meetings are typically once every one or two weeks. The maximum length of these programs varies, but is generally around six months. Most of that time is spend searching for a job, so if workers find a job earlier, they don't have to finish the six month program. In addition, programs often start up to a few months before the date the job actually ends. Therefore there is little risk of lock-in as a reason for longer unemployment durations.

The level of severance pay in a social plan is mostly determined by the level of tenure. The formula used in all social plans is (number of years of tenure * monthly wage * C). Years of tenure are frequently weighted, where years until 40 years old count for 1, years between 40 and 50 for 1.5 and years after 50 for 2. The factor C is determined by the bargaining power of the firm and the unions. The lowest number is around 0.5 if a firm has little to spend or spends a lot on other arrangements (e.g. early retirement). Some firms, for instance large financial institutions, are able to afford more and in such a social plan C increases to about 2. With this formula, severance pay for a worker with 15 years of tenure would normally be around 1.5 times their yearly earnings.

3 Data and descriptive analysis

I use administrative matched employer-employee data from Statistics Netherlands on workers who lost their jobs through collective dismissals and bankruptcies. The data contain detailed information on the labour market status of these workers on a daily basis up until five years after their dismissal. Firm-level data include sector and firm size. Data from municipal registrations add information on date of birth, sex and family characteristics. These data are merged to a unique dataset with social plans from Dutch firms for the period 2003 to 2007. Wages are recorded monthly. The data don't contain information on hours worked.

The advantage of using only data on workers displaced through collective dismissals or

bankruptcies is that there is no relation between unobserved characteristics of these workers, such as ability, and the fact that they were displaced. This avoids selection bias compared to a sample containing only individual dismissals (Gibbons and Katz, 1991).

The literature on displaced workers shows that it is important to take into account that some workers might leave the firm before it files for bankruptcy. If workers have private information about an impending bankruptcy, those with the best outside options tend to leave earlier. Hence, if we only use the workers left at the moment of bankruptcy, we end up with a selected sample of workers. The common solution is to also include workers who left up to one year before the firm closure, or sometimes even two years. Taking a wider window reduces the problem of early leavers, but it increases the probability to include workers who left for other reasons.⁴ I include all workers who left up to one year before the bankruptcy.⁵ Note that the problem of early leavers doesn't play a role for collective dismissals with social plans, because workers have an incentive to stay at the firm until the end. First, they don't know until a couple of months before the actual layoff who will be displaced. Second, severance pay and other arrangements only apply to workers who stayed.

I restrict my sample to prime age workers between 20 and 50 to prevent that unobserved early retirement leads to long nonemployment durations. After trimming the top and bottom 1% of monthly wages and dropping observations with missing values, I have a sample of 49,800 displaced workers. Of these, 44,793 are displaced through a bankruptcy and 5,007 are displaced in a collective dismissal with a social plan.

I examine the effects of social plans on both the unemployment duration and the wage workers earn in the first full month of their next job if they find one. I also take into account that some workers find a job immediately after losing their current job. For these workers I observe an unemployment duration of zero, but their ability to find a job quickly contains valuable information, so they have to be taken into account as well.⁶ An unemployment spell is defined as a period where individuals are not employed. They don't have to be registered at the unemployment office. Table 1 shows descriptive statistics on outcome variables for workers who are offered a social plan and for those who are not. The table shows that workers who are displaced without a social plan are less likely to find a job that starts right after their current job ($1 -$ the probability to start an unemployment spell). But for those who become unemployed, the median unemployment spell is 156 days for workers displaced with a social plan and 109 days for workers displaced without a social plan. Finally, the mean

⁴There are no conclusive results from using a wider window. Dustmann and Meghir (2005) find no significant difference and Eliason and Storrie (2006) find stronger results from displacement if they use a wider window.

⁵Unfortunately, the data don't allow me to select a different window for a sensitivity analysis.

⁶Note that the transition from the old job to the new job is somewhat fuzzy. For example, it could be that workers who are about to be laid off continue to be paid, but at the same time are given room to actively search for a job. This is effectively captured by taking into account who enters an unemployment spell.

wage for workers displaced with a social plan is lower than for workers displaced without a social plan.

I include a wide range of control variables to take into account both personal, previous job, firm and labour market characteristics. For personal characteristics I include age, sex and family situation. For previous job characteristics I include wage and tenure. For firm level characteristics I include 10 sectors and 3 firm size categories. Finally I control for the overall economic situation by including calendar year and quarter dummies. All variables are measured at the moment of inflow into unemployment. One exception are the year and quarter dummies for the wage equation, which are measured at the moment of finding a job, since the accepted wage might depend on the economic situation at that time. Table 2 shows descriptive characteristics for the control variables for both groups. Workers who receive a social plan are more often women, they are older and have earned more in their previous jobs. There are also some differences between sectors. These descriptives suggest that it is important to control for many observed characteristics. But since workers most likely differ on unobserved characteristics as well, this should be taken into account.

3.1 Descriptive analyses

Figure 2 shows the empirical unemployment exit (hazard) rates for workers with and without social plans. This figure only includes workers who enter an unemployment spell. The figure shows that the exit rate is quite high in the first couple of months, but steadily declines until it is almost constant after about 18 months. Especially in the first year the exit rate is higher for workers without social plans.

Figure 3 shows the empirical earnings hazards for workers with and without social plans. The earnings hazard increases as the wage increases, indicating that more people ‘exit’ the earnings distribution at higher wage levels than at lower wage levels. The earnings hazard seems to be higher for workers with a social plan in the beginning of the distribution, and slightly lower in the middle of the distribution. This suggests that wages will be lower for workers with a social plan. Note that since wages are not censored for workers who find a job, all workers have to ‘exit’ the earnings distribution. This is why the hazard rate peaks at the end.

The two figures provide *prima facie* evidence that social plans have a negative effect on unemployment exit rate for displaced workers and the wage in their next job. However, these graphs don’t control for observed and unobserved heterogeneity and could be subject to selection bias. In the next section I discuss my strategy for taking this into account.

4 Econometric Analysis

I estimate a multistate duration model to take into account both unemployment dynamics and the quality of the job found after employment. As explained in more detail below, individuals go through a spell of unemployment and a subset of them find a job. Furthermore, I take into account that some individuals might start a new job right after they are displaced from their current job. The fact that these individuals don't experience an unemployment spell provides valuable information about the effect of social plans on labour market outcomes.

4.1 Individuals' labour market histories

Each individual goes through the following event history. At t_0 individuals are informed that they will be dismissed at some point in the future, t_1 . This can either be through a collective dismissal with a social plan ("treatment") or through a bankruptcy without a social plan ("control"). It is important to note that t_0 is unobserved. This means that I can't take into account the time period that people might search for a job between t_0 and t_1 . At t_1 individuals are dismissed. At that point they can either directly move into a new job, or they can enter unemployment. Unemployment lasts from t_1 to t_2 or it is censored if it is longer than t_2 . Unemployment spells are censored at the end of the observation period (January 1, 2010) or if they last longer than three years.

At time t_1 individuals enter a new employment spell and I observe their wage in the first full month of employment. If individuals entered a new job right after exiting their previous job, I also observe their wage.

This event history suggests several possible sources of selection bias. First, individuals are selected in receiving a social plan. Second, individuals select into unemployment or find a job directly. Third, if individuals go through unemployment, some of them find a job and receive a wage and others are censored.

I model the event histories of individuals using a Mixed Proportional Hazards (MPH) framework (Van den Berg, 2001). To avoid parametric assumptions as much as possible, I follow the recent literature and use a flexible piecewise constant specification of the duration dependence and rely on a discrete mass points distribution for the unobserved heterogeneity.

4.1.1 Unemployment duration

The model for the hazard to leave unemployment (conditional upon having entered unemployment, see section 4.1.2), or the unemployment exit rate, is specified as

$$\theta_u(t_u|x, d, v_u) = \lambda_u(t_u) * \exp(x'\beta_u + d'\gamma_u + v_u) \quad (1)$$

where t_u is the time in unemployment, x is a set of observable characteristics, d is the

indicator for whether a worker receives a social plan and v_u is unobserved heterogeneity. λ_u is individual duration dependence, which is modeled as a piecewise constant:

$$\lambda_u(t_u) = \exp\left(\sum_k (\lambda_{u,k} * I_k(t_u))\right) \quad (2)$$

where $k = 0, \dots, 3$ and I_k are time-varying dummy variables for the specified time periods.⁷

The likelihood contribution of an unemployment spell is given by

$$\mathcal{L}_u(t_u|x, d, v_u) = \prod_{i=1}^I \int_{v_u} \theta_u^{c_u}(t_u|x, d, v_u) S_u(t_u|x, d, v_u) dG(v_u) \quad (3)$$

where c_u is a censoring indicator, being 1 if the respective spell is not censored and zero otherwise. S_u is the survivor function for these spells, given by $S_u(t_u|x, d, v_u) = \exp(-\int_0^{t_u} \theta_u(z|x, d, v_u) dz)$. Unobserved heterogeneity is given by the vector v_u and $G(v_u)$ is the corresponding cumulative joint distribution (see section 4.4).

4.1.2 Direct unemployment exits

At point t_0 individuals either enter unemployment or they directly start a new job. In the latter case the unemployment spell length is effectively zero. I model this selection process into unemployment explicitly with a logit model where unobserved heterogeneity enters similarly to the MPH model above:⁸

$$\Pr(\text{unemployment} = 1|x_i, v_s) = F_{\epsilon_i}(x_i\beta + v_s) \quad (4)$$

and ϵ_i distributed logistically, so that the likelihood contribution for individual i entering ($s_i = 1$) or not entering ($s_i = 0$) unemployment spell t is given by

$$\mathcal{L}(x, v_s) = \prod_{i=1}^I \int_v \zeta_i^{s_i} * (1 - \zeta_i)^{1-s_i} dG(v_s) \quad (5)$$

where $\zeta_i = \frac{\exp(x'\beta + v_s)}{(1 + \exp(x'\beta + v_s))}$. Furthermore, it is important to note that the unemployment hazards defined above are conditional upon $s_i = 1$.

⁷I use splits at 0, 2, 4 and 12 months. I normalize $\lambda_{u,0} = 0$. This specification follows the data quite closely. I tried several more detailed specifications of the duration dependence function, but it proved very difficult to achieve convergence of the likelihood function.

⁸The method of including a logit equation in a multistate model has been used earlier (Ham and Lalonde, 1996; Tatsiramos, 2010). However, these papers use it to model selection into treatment. In my case the logit models the effect on an outcome variable (i.e. whether an individual starts an unemployment spell).

4.2 Wages

I follow the recent literature and model wages with a mixed proportional hazards (MPH) model.⁹ This model is more flexible than the common linear log-wage model.¹⁰ In addition, this specification allows a relatively easy and flexible way of taking into account unobserved heterogeneity, which is an important source of possible selection bias.

The wage is modeled similarly as the unemployment model above. The model for the hazard to earn at least w (conditional upon having found a job) is specified as

$$\theta_w(w|x, d, v_w) = \lambda_w(w) * \exp(x'\beta_w + d'\gamma_w + v_w) \quad (6)$$

where the different parts of the equation are defined as above. The interpretation of the MPH model for wages is different than the linear log-wage model. The wage hazard θ_w should be interpreted as the probability that you earn a wage w , conditional upon earning at least w . This means that the interpretation of the effect of social plans is reversed compared to the unemployment hazard. If a program has a positive effect on the wage hazard, it negatively affects the wage. By allowing for a piecewise constant baseline hazard, the model is more flexible than the linear log-wage model.¹¹ The only assumption is that wages follow an MPH structure, which means that the hazard is proportional in x' and that v_w is independent of x' .

The likelihood contribution of observed wages is given by

$$\mathcal{L}(w|x, d, v_w) = \left(\prod_{i=1}^I \int_v \theta_w(w|x, d, v_w) S_w(w|x, d, v_w) dG(v_w) \right)^{c_y} \quad (7)$$

where all elements are defined as before and c_y is an indicator that is 1 if an individual found a job (either after going through a spell of unemployment or directly after losing her previous job). Note that due to the detailed administrative data I use, wages are always observed for individuals who find a job. A censoring indicator is therefore not necessary.

The full likelihood of the model (suppressing conditioning) is given by

$$\mathcal{L} = \prod_{i=1}^I \int_v (\theta_u^{c_u}(t_u) S_u(t_u))^{s_i} \zeta_i^{s_i} (1 - \zeta_i)^{1-s_i} (\theta_w(y_w) S_w(y_w))^{c_y} dG(v_u, v_s, v_w) \quad (8)$$

⁹Donald et al. (2000) are the first to model wages using a proportional hazard model and Cockx and Picchio (2009) extend their approach to the mixed proportional hazard model. Also see Arni et al. (2013) for a recent application.

¹⁰Nevertheless, the models are strongly related. If wages follow an exponential distribution, the parameters from an MPH model are the same as the negatives of the parameters in the log-wage model. As a sensitivity analysis I also estimate the model with a standard log-linear wage equation (Section 6). As expected, the results turn out to be quite similar.

¹¹I use splits at 0, 1000, 1600 and 2200 euros. I normalize $\lambda_{w,0} = 0$.

4.3 Accounting for multiple selections

Individuals are selected at multiple points in time. First, there is a selection into treatment. This is non-random. Second, there is a selection into unemployment. Some individuals enter unemployment after being laid off, while others directly start another job. Third, there is selection into employment. Some individuals find a job, whereas others don't. To take this multiple selectivity into account, I simultaneously model the selection process into unemployment and employment and allow for correlation between the different states for each individual (Gritz, 1993; Ham and Lalonde, 1996).

The only limitation is that I can't simultaneously model the selection into treatment. Basically the identifying assumption is that, conditional upon X and v , workers displaced through a bankruptcy or a mass layoff have the same re-employment opportunities, except that workers displaced in a mass layoff receive a social plan and those displaced in a bankruptcy don't. Given the institutional background and the data, I believe this assumption is plausible. First, the most important parameters of job search, unemployment benefits and the distribution of job wage offers, don't depend on the type of layoff. Second, both bankruptcies and collective dismissals are arguably exogenous dismissals, so individuals have no way of selecting themselves into treatment. One could argue that by selecting which firm to work at, individuals could select into the "good" firms that don't go bankrupt. This implies that individual workers have a good sense of which firms could go bankrupt. One way of overcoming this argument is to use only workers who were at the firm in their previous job for a long time, so that it would be difficult for them to have selected into a firm on the probability that it might go bankrupt in the future. This possibility will be discussed in the sensitivity analyses. Despite these arguments, there is some evidence that shows that workers displaced in a mass layoff have a better labor market position than workers displaced in a bankruptcy (Hijzen et al., 2010). This means that if I find any negative effects of a social plan, they are likely to be an underestimation of the actual effect.

4.4 Specification of unobserved heterogeneity

Estimating the model requires that the joint distribution of the unobserved heterogeneity terms $G(v_u, v_s, v_w)$ is specified. I follow standard practice in the literature and approximate it by a multivariate discrete distribution (Heckman and Singer, 1984). Each heterogeneity component has M points of support. Each of the equations specified above features one unobserved heterogeneity component with M support points each $(v_u^M, v_s^M, \text{and } v_w^M)$. The probabilities associated with these mass points are

$$Pr(v_u = v_u^M, v_s = v_s^M, v_w = v_w^M) = p_i \tag{9}$$

The probabilities are specified as log transforms to ensure that they are between 0 and 1 and given by $p_i = \frac{\exp(q_i)}{\sum_i \exp(q_i)}$. The last q_i is normalized to zero.

5 Results

I start with estimating the three processes separately, essentially imposing no correlation between them. Table 3 shows the estimation results for the three separate models.¹² The results suggest that social plans, other things equal, have a small negative effect on the exit rate out of unemployment (column 1). On the other hand, they lead to a lower probability to become unemployed in the first place (column 3). Finally, social plans increase the wage hazard, which means that they have a negative effect on wages. In principle all models allow for unobserved heterogeneity with an unlimited number of mass points. During estimation, it turned out that for both the unemployment duration and the wage equation, two mass points could be identified. The probability for the third mass point quickly converged to zero. This could already be suspected from the skewed distribution of the first two mass points. For the logit equation only one mass point could be identified, and, since a constant is included, the model reduces to a standard logit model.

I continue with the full model where I allow for correlation between the three processes. Table 4 shows the estimation results. First note that in this model the maximum likelihood was obtained with full correlation between the mass points of the wage and the duration equation. Therefore, only one probability parameter was estimated. Second, for the logit equation again no second mass point could be identified. If we compare the likelihood of the full model with that of the three separate models, it turns out that the full model performs better, even while having fewer parameters.¹³ This means that the full model is preferred to the three separate models and that the correlation structure between the processes should be taken into account. The values and distribution of the mass points suggest that there is a group of about 27% who exit unemployment late, but that this group also has a lower earnings hazard, suggesting that their late unemployment exit is associated with higher earnings than those who exit earlier.

The estimates for the full model show that social plans lead to an 11% lower probability to start an unemployment spell after individuals lose their current job (Table 4, column 1). But for those workers who do enter unemployment, the unemployment exit rate is lower than for workers without social plans. In terms of percentage changes ($\exp(\delta_u) - 1$), a social plan leads to an 8.5% lower probability to exit to a job (column 2). Once individuals exit to a job, a social plan also leads to lower wages. The hazard for wages in the first full month of

¹²Note that wages are divided by 100 to circumvent extreme values.

¹³In the three separate models a total of 92 parameters are estimated, while in the full model 91 parameters are estimated, since only one probability parameter has to be estimated to get the maximum likelihood.

employment increases by about 15% for workers with a social plan (column 3).

The interpretation of these results is in terms of the net effect of severance pay and job search assistance. The literature shows that severance pay has a negative effect on the probability to exit unemployment, while job search assistance has a positive effect. Taken together this suggests that if we find a positive effect of social plans on the exit rate, the positive effects of job search support dominate the negative effects of severance pay and vice versa. The higher probability to start a new job right after exiting unemployment for workers with a social plan suggests that job search support, which typically starts some time before the current job ends, dominates the negative effects severance pay might have.¹⁴ On the other hand, once workers enter unemployment, the negative effects of severance pay dominate any positive effects job search support might have. While there is no clear prediction for the effects on wages, the results suggest that longer unemployment durations experienced by displaced workers with a social plan actually lead to lower wages.¹⁵ One explanation for this somewhat puzzling result is an income effect of severance pay. Workers who receive a large sum of severance pay might simply be taking more leisure. If they continue to work at the same hourly wage, this translates into a lower measured monthly wage.¹⁶ Another explanation could be some remaining selection bias. If firms find ways around the rules to dismiss the least productive workers in a collective dismissal, they might experience sharper wage losses on average than workers displaced through a bankruptcy, where both productive and unproductive workers lose their jobs. Given the data it is impossible to fully discount this explanation, but in the institutional framework it is not the most plausible explanation.

The interpretation of the other variables are straightforward. As expected, older workers have a worse labour market position after being displaced.¹⁷ Age positively affects the probability to start an unemployment spell, and negatively affects the exit rate and the earnings hazard. Being female also negatively affects the probability to find a job immediately after losing the current job and negatively affects the exit rate out of unemployment. In addition, women have a higher earnings hazard than men. Similar interpretations can be given for the other control variables.

¹⁴In addition, the “fuzziness” of job endings mentioned in section 3 could also play a role. Workers with a social plan could’ve been given more time to search for a new job while still formally employed at their current job. This affects their probability to start an unemployment spell apart from job search assistance.

¹⁵This is not in line with the findings in Card et al. (2007) who find no effects of severance pay on subsequent match quality.

¹⁶Working hours are very flexible in the Netherlands and parttime work among both men and women is more common than in most other OECD countries.

¹⁷Also see Deelen et al. (2014) for an analysis of the different labour market positions of older and younger displaced workers in the Netherlands.

6 Sensitivity analyses

To check the robustness of my results, I perform several sensitivity analyses. First, I estimate the full model with a log-linear wage equation instead of the MPH model. In this case, the contribution to the likelihood of an individual, conditional on unobserved heterogeneity, is

$$\mathcal{L}(w|x, d, \alpha) = \phi\left(\frac{\ln w_i - \alpha_m - x'\beta_w - d'\gamma_w}{\sigma}\right)^{c_y} \quad (10)$$

where ϕ is the p.d.f. of the standard normal distribution, w_i is an individual's wage, x are control variables and d indicates whether a worker receives a social plan. Unobserved heterogeneity is specified through allowing the intercept α_m to differ across mass points. This makes the model more flexible than a regular log-linear wage model. c_y is 1 if an individual has found a job. Panel B of Table 5 shows the estimation results. Panel A reproduces the baseline estimates from Table 4 for easy comparison. As is clear, both the estimates for the probability to enter unemployment and the unemployment exit rate are similar across the two models. The estimates for the earnings indicate that a social plan reduces earnings by about 11%. This is quite similar to the MPH earnings model, which showed negative effects of about 15%.¹⁸ This means the estimated effects on wages are not sensitive to the specification of the wage model.

Second, one could argue that despite my efforts to control for different forms of selection bias, there is still some selection in whether individuals are displaced with or without a social plan. While in the absence of a controlled experiment it is difficult to completely remove these worries, it could be interesting to look at individuals with different levels of tenure. If individuals started in their current job several years before their displacement, it would be harder for them to select themselves into a job where they think there is a higher probability of receiving compensation if they are displaced. Panels C and D of Table 5 shows the estimation results when the sample is restricted to workers with at least three years of tenure and five years of tenure. The results are qualitatively similar to the baseline results, but they do suggest that as workers have longer tenure, both the positive effects on the probability to start a new job right after losing the current job and the negative effects on unemployment duration and wages are amplified. One reason could be that workers with a social plan and higher tenure usually get a larger amount of severance pay than workers with shorter tenure. This suggests that it is indeed the presence of a social plan driving the results and not workers selecting themselves into jobs.

Finally, there were two important reforms in 2006 that could affect the results. First, in March 2006 a reform changed the rules for determining which workers should be displaced in a mass layoff. Before the reform firms could choose between simply applying a Last-In-First-

¹⁸The estimates should be exactly the same if the earnings follow an exponential distribution.

Out (LIFO) rule or applying the LIFO rule within age brackets of 10 years. In the first case, mostly younger workers who have shorter tenure are displaced, while in the second case older workers are also displaced. After the reform the LIFO rule within age brackets of 10 years became the rule. This reform could have affected the population of displaced workers and thereby affect the estimation results. Second, in October 2006 entitlement to unemployment benefits was reduced for most workers, for some even up to 22 months. Previous evidence suggests that job finding rates increased, but job quality declined (De Groot and van der Klaauw, 2014; Deelen et al., 2014). Panel E in Table 5 shows the estimation results when restricting the sample to only workers displaced before 2006. The effect of social plans on the unemployment exit rate is actually quite similar. However, the effect on the earnings hazard is about twice as small as in the baseline estimates, and the effect on entering unemployment turns insignificant. This is consistent with previous evidence on a decline in job quality for job finders after 2006.

7 Simulations of effects

To get a sense of the size of the estimated effects, Table 6 presents the results of some simulation exercises based on the main estimates in Table 4. All outcomes are calculated for a “median worker” conditional on unobserved heterogeneity.¹⁹ The unobserved heterogeneity is subsequently integrated out over the estimated distribution. Therefore, the simulations should be interpreted as the estimated average effects for a median worker in the sample.

The estimated effect of a social plan on the job-finding probability is quite small. The probability to find a job without an intervening unemployment spell increases by 1.2 percentage points if workers have a social plan. For workers who become unemployed, the probability to find a job within six months is 2.5 percentage point lower for workers with a social plan than for workers displaced without a social plan. The difference becomes smaller as time goes on. The table also presents the total-job finding probability for the whole sample, including both the probability to find a job directly, and conditional on entering unemployment, the probability to find a job within a certain amount of time. Within six months, the job finding probability is 61.3% for workers with a social plan and 62.5% for workers without a social plan. Overall, social plans reduce job finding probabilities by around 1 percentage point.

The simulations also show that wages in the first job are about 8% lower for workers with a social plan than for workers without a social plan. This is similar to what we saw in the descriptive statistics (Table 1). The predicted values however differ quite substantially from the sample medians, which indicates that the model doesn’t do a very good job of predicting

¹⁹A median worker is defined as male, between 40 and 50 years of age, married with children, has 40 months of tenure, a previous monthly wage of 2.000 euros and works in construction in a firm with less than 100 employees.

the expected wage. The reason could be a lack of control variables that are important for predicting the wage, such as education level.

8 Discussion and conclusion

Many OECD countries have policies in place that on the one hand offer job search assistance to displaced workers and on the other hand require firms to pay severance pay to displaced workers. In fact, in many countries firms are required to offer a social plan containing both of these measures. While it seems obvious that severance pay and job search assistance could have conflicting effects on incentives for workers, this is the first paper to evaluate their joint effect on re-employment probabilities and subsequent job quality. I compare workers displaced through collective dismissals and firm closures, who should be similar in the sense that in both cases firms do not have the ability to select which workers will be displaced. The identifying assumption is that workers displaced through collective dismissals are similar to workers displaced through bankruptcies, except that the first receive compensation in the form of a social plan and the latter don't.

After controlling for observed and unobserved heterogeneity and taking various possible forms of selection bias into account, I find that social plans have a positive effect on the probability to find a job during the notice period, but have a negative effect on unemployment durations and subsequent job quality. These results suggest that during the notice period job search assistance is more important, while when workers do become unemployed, severance pay dominates job search support for displaced workers.

These conclusions require some qualifications. In addition to whether workers are offered severance pay and job search assistance, the design of a social plan could also be important for its effects. Some social plans offer workers a lump sum if they haven't found a job after some time, or they deduct the amount spend on job search assistance from the severance pay. Such design choices provide an incentive for workers to lower their search effort and could thereby hamper any positive effects job search assistance might have. In addition, the job search programs offered are not homogeneous. It could be that some of them are effective, even in the presence of a severance payment. My data don't allow me to conclude anything about the merits of individual programs. Finally, despite my efforts to take selection bias into account, I cannot rule it out completely and some of the results could still be driven by it.

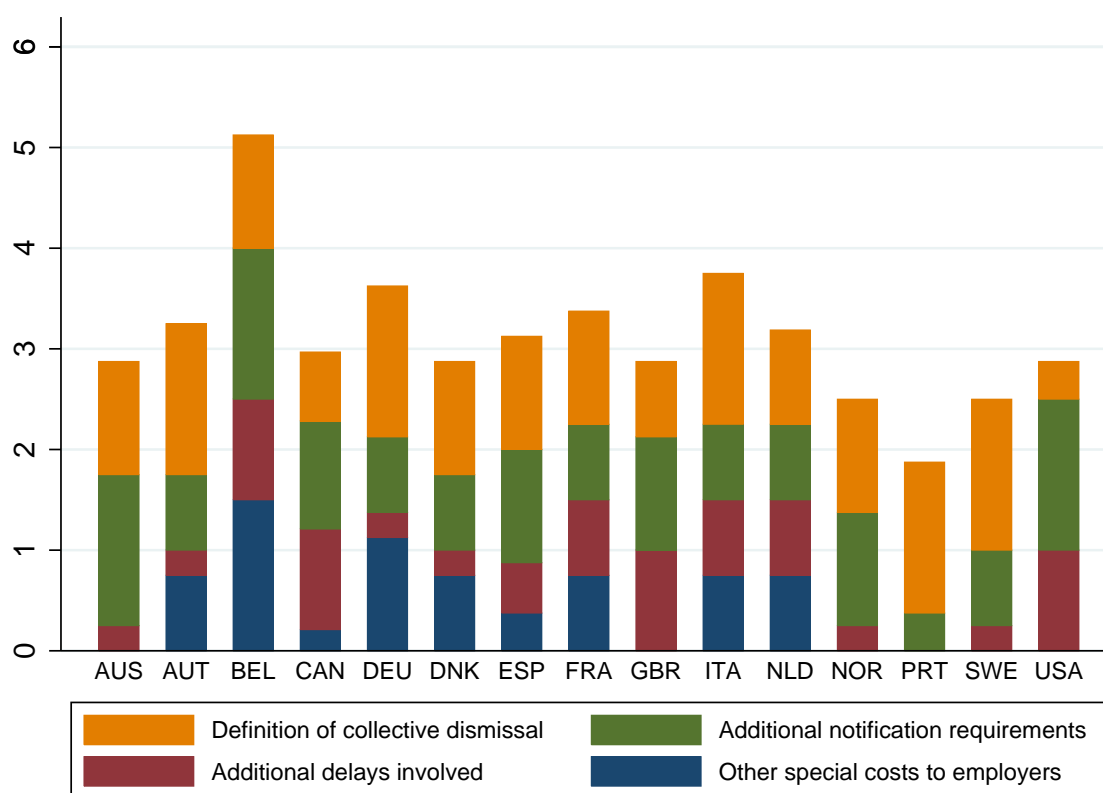
Nevertheless, I believe these results are of interest to policy makers as well. Since many countries require firms to offer social plans, they could also further stipulate that social plans should not contain any outright contradictory incentives such as the examples mentioned before. But even apart from such obvious cases, the conflicting incentives in different policies aimed at protecting and helping workers are important areas for further research.

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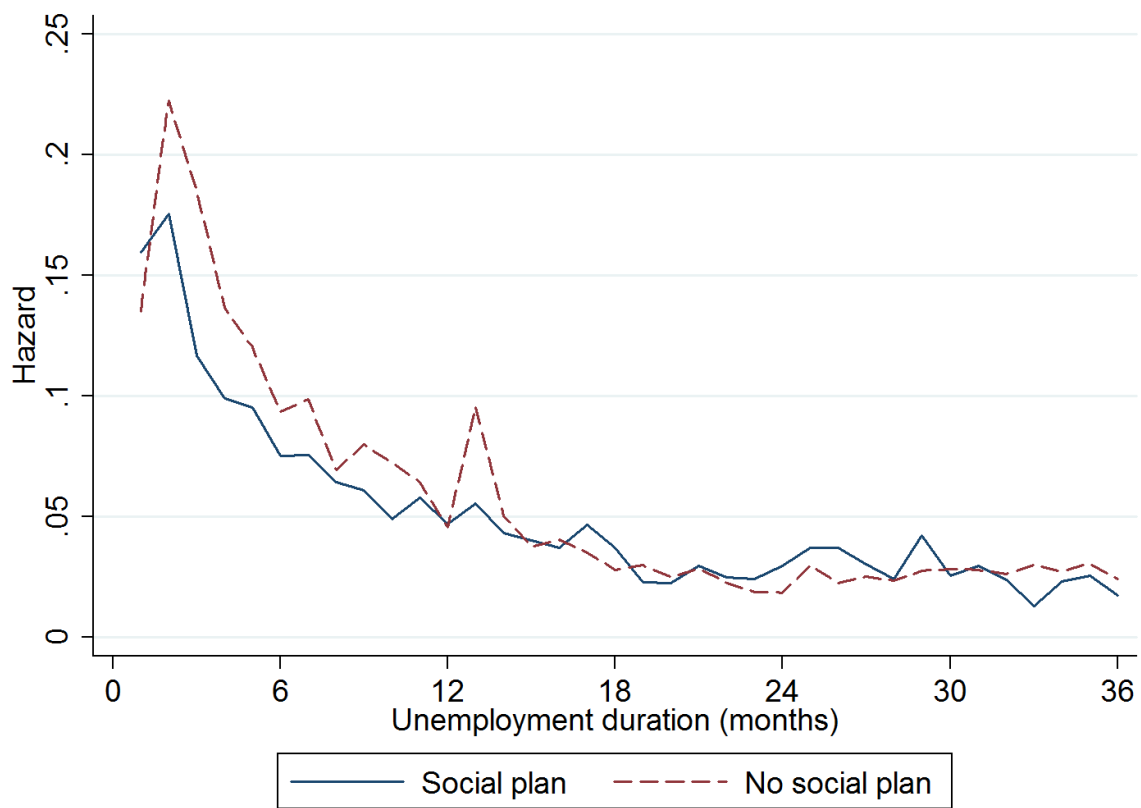
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Figure 1: Contribution of various elements to strictness of EPL related to collective dismissals for a selected set of countries on OECD scale from 0 to 6.



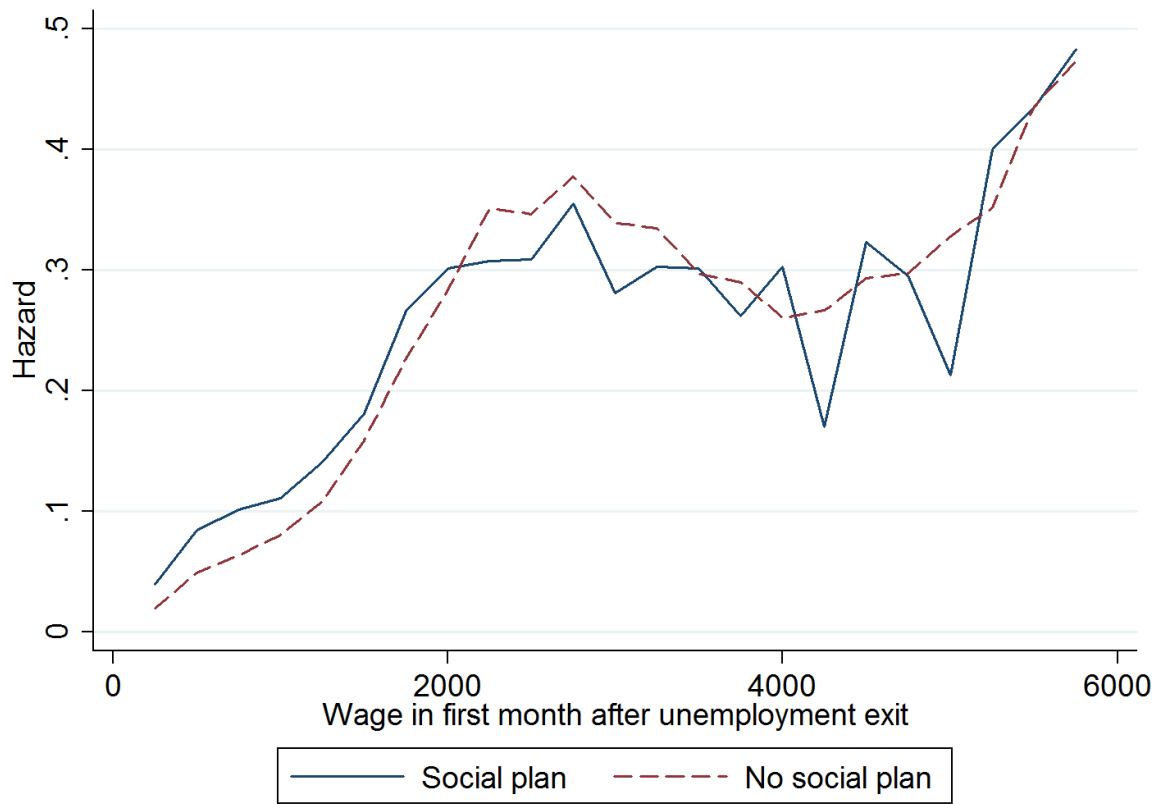
Source: See OECD (2013) for the full set of countries.

Figure 2: Empirical unemployment exit rates for workers with and without social plans



Source: Own calculations based on registration data from Statistics Netherlands.

Figure 3: Empirical earnings hazards for workers with and without social plans



Source: Own calculations based on registration data from Statistics Netherlands.

Notes: The hazard rate is calculated for wages in steps of 250 euros.

Table 1: Summary statistics on outcome measures.

	Median	Mean	Std. dev.	<i>N</i>
Social plan				
Start an unemployment spell		.71	.46	5,007
Unemployment duration (days)	156	353	401	3,531
Monthly wage in new job (euros)	1,535	1,622	982	4,519
No social plan				
Start an unemployment spell		.81	.39	44,793
Unemployment duration (days)	109	292	372	36,248
Monthly wage in new job (euros)	1,737	1,802	931	40,531

Notes: The probability for a worker to find a job right after they lost their current one is 1 – the probability to start an unemployment spell.

Source: Own calculations using registration data from Statistics Netherlands on displaced workers.

Table 2: Summary statistics on control variables.

	Social plan		No social plan	
	Mean	Std. dev.	Mean	Std. dev.
Female	.45	.50	.28	.45
Age 20 - 29	.27	.44	.32	.47
Age 30 - 39	.36	.48	.39	.49
Age 40 - 50	.37	.48	.29	.46
Tenure (months)	103	84	52	55
Monthly wage 6 months before displacement (euros)	2172	1243	1868	943
Monthly wage 12 months before displacement (euros)	2073	1136	1860	908
Married	.77	.43	.76	.42
Kids	.60	.49	.59	.49
Sector of industry				
Manufacturing	.26	.44	.20	.40
Construction	.02	.13	.15	.36
Wholesale and retail trade	.35	.48	.19	.39
Transport and storage	.01	.11	.08	.27
Information and communication	.16	.36	.01	.10
Financial institutions	.01	.09	.06	.23
Other business services	.10	.27	.22	.42
Health and social activities	.09	.29	.09	.28
Firm size				
20 - 99 employees	.04	.19	.79	.41
100 - 499 employees	.15	.35	.15	.36
500+ employees	.82	.39	.06	.23
Quarter of unemployment entry				
1	.34	.47	.18	.38
2	.21	.41	.21	.41
3	.22	.42	.19	.39
4	.23	.42	.42	.49
Year of job loss				
2003	.08	.28	.27	.44
2004	.33	.47	.18	.39
2005	.40	.49	.14	.35
2006	.10	.30	.26	.44
2007	.08	.28	.15	.36
<i>N</i>		5,007		44,793

Source: Own calculations using registration data from Statistics Netherlands on displaced workers.

Table 3: Parameter estimates with the three processes estimated separately.

	(1) Enter unem- ployment (<i>s</i>)	(2) Unemployment duration (<i>u</i>)	(3) Wage in first job (<i>w</i>)
Social plan	−.1269** (.0544)	−.0565*** (.0329)	.1221*** (.0213)
Female	.1043*** (.0277)	−.1007*** (.0147)	.2078*** (.0110)
<i>Age at start of spell (ref: Age 20 - 29)</i>			
Age 30 - 39	.2201*** (.0289)	−.3070*** (.0155)	−.0913*** (.0115)
Age 40 - 50	.4699*** (.0340)	−.4345*** (.0174)	−.0601*** (.0131)
Married or cohabitating	−.2199*** (.0300)	.0536*** (.0157)	−.0550*** (.0115)
Kid(s) in household	.1235*** (.0258)	.0088 (.0138)	.0633*** (.0102)
Tenure (months) / 10	.0122*** (.0023)	−.0031*** (.0012)	.0071*** (.0009)
Monthly wage 6 months before layoff / 100	.0275*** (.0066)	.0183*** (.0038)	.0261*** (.0031)
Monthly wage 12 months before layoff / 100	−.0481*** (.0070)	−.0166*** (.0040)	−.0968*** (.0033)
<i>Duration dependence (ref: Month 0 - 2)</i>			
Month 2 - 3		−.0444** (.0178)	
Month 4 -12		−.7361*** (.0173)	
Month 12+		−1.9478*** (.0217)	
<i>Wage splits (ref: 0 - 1000 euros)</i>			
Wage split 1000-1600			1.0794*** (.0138)
Wage split 1600-2200			1.8064*** (.0143)
Wage split 2200+			1.9118*** (.0179)
Unemployment duration (months)			.0132*** (.0003)
<i>Unobserved heterogeneity</i>			
v_i^a (constant)	1.4272*** (.0560)	−.8137*** (.0345)	−1.8486*** (.0249)
$v_i^b - v_i^a$	−	−4.1586*** (.0369)	−2.0279*** (.0673)
q		3.0790*** (.0274)	−4.2631*** (.0927)
$P(v_i^b = 1)$.9560	0.0139
N		49,800	
Log likelihood (combined)		−392, 390	

Notes: Controls for sector, firm size and quarter and year of inflow into spell (either unemployment or job spell) are included. Standard errors in parentheses. Mass points for unobserved heterogeneity are given by v_i , where $i = s, u, w$. Significance levels: * : 10% ** : 5% *** : 1%.

Source: Own estimations using registration data from Statistics Netherlands on displaced workers.

Table 4: Parameter estimates of full model for the effect of social plans.

	(1) Enter unem- ployment (<i>s</i>)	(2) Unemployment duration (<i>u</i>)	(3) Wage in first job (<i>w</i>)
Social plan	−.1216** (.0552)	−.0889*** (.0334)	.1395*** (.0250)
Female	.0889*** (.0282)	−.1651*** (.0153)	.2022*** (.0126)
<i>Age at start of spell (ref: Age 20 - 29)</i>			
Age 30 - 39	.1683*** (.0294)	−.2185*** (.0162)	−.0947*** (.0131)
Age 40 - 50	.3914*** (.0346)	−.3494*** (.0182)	−.0642*** (.0149)
Married or cohabitating	−.2238*** (.0304)	.1212*** (.0163)	−.0567*** (.0131)
Kid(s) in household	.1291*** (.0262)	−.0140 (.0143)	.0571*** (.0116)
Tenure (months) / 10	.0116*** (.0024)	−.0050*** (.0012)	.0064*** (.0010)
Monthly wage 6 months before layoff / 100	.0345*** (.0069)	.0029 (.0041)	.0183*** (.0034)
Monthly wage 12 months before layoff / 100	−.0561*** (.0073)	−.0010 (.0043)	−.0858*** (.0037)
<i>Duration dependence (ref: Month 0 - 2)</i>			
Month 2 - 3		−.0462*** (.0165)	
Month 4 -12		−.4238*** (.0169)	
Month 12+		−.9267*** (.0247)	
<i>Wage splits (ref: 0 - 1000 euros)</i>			
Wage split 1000-1600			1.0727*** (.0155)
Wage split 1600-2200			1.7755*** (.0162)
Wage split 2200+			1.8045*** (.0196)
Unemployment duration (months)			.0127*** (.0004)
<i>Unobserved heterogeneity</i>			
v_i^a (constant)	1.4215*** (.0570)	−4.4898*** (.0345)	−1.8248*** (.0290)
$v_i^b - v_i^a$	−	−3.4262*** (.0935)	−1.5966*** (.0479)
q		−1.0102*** (.0263)	
$P(v_i^b = 1)$.2669	
N		49,800	
Log likelihood		−353,649	

Notes: Controls for sector, firm size and quarter and year of inflow into spell (either unemployment or job spell) are included. Standard errors in parentheses. Mass points for unobserved heterogeneity are given by v_i , where $i = s, u, w$. Significance levels: * : 10% ** : 5% *** : 1%.

Source: Own estimations using registration data from Statistics Netherlands on displaced workers.

Table 5: Parameter estimates of sensitivity analyses.

	(1) Enter unemployment (<i>s</i>)	(2) Unemployment duration (<i>u</i>)	(3) Wage in first job (<i>w</i>)	<i>N</i>
<i>A. Baseline estimates</i>				
Social plan	-.1216*** (.0552)	-.0889*** (.0250)	.1395*** (.0334)	49,800
<i>B. Log-linear wage equation</i>				
Social plan	-.1200*** (.0553)	-.0703*** (.0291)	-.1135*** (.0083)	49,800
<i>C. Tenure \geq three years</i>				
Social plan	-.1050*** (.0453)	-.1418*** (.0253)	.1749*** (.0321)	24,526
<i>D. Tenure \geq five years</i>				
Social plan	-.2808** (.0486)	-.1949*** (.0365)	.2060*** (.0514)	16,407
<i>E. Only workers displaced before 2006</i>				
Social plan	.0270 (.0415)	-.1190*** (.0406)	.0673** (.0297)	32,416

Notes: Controls for personal and job characteristics, sector, firm size and quarter and year of inflow into spell (either unemployment or job spell) are included. Unobserved heterogeneity is also included in all models as in the baseline model. Standard errors in parentheses. Significance levels: * : 10% ** : 5% *** : 1%.

Source: Own estimations using registration data from Statistics Netherlands on displaced workers.

Table 6: Simulations for the effect of social plans.

	(1) Social plan	(2) No social plan	(3) Difference
Probability to find a job without an unemployment spell	11.6	10.4	1.2
<i>For workers who become unemployed</i>			
P(Exit unemployment within 6 months)	49.7	52.2	-2.5
P(Exit unemployment within 12 months)	63.0	65.0	-2.0
P(Exit unemployment within 24 months)	71.0	72.2	-1.2
<i>Total job-finding probability for the whole sample</i>			
P(find a job within 6 months)	61.3	62.5	-1.2
P(find a job within 12 months)	74.5	75.3	-0.8
P(find a job within 24 months)	82.5	82.6	-0.1
<i>Wages</i>			
Median wage (euros)	1202	1301	-99

Notes: Simulations are based on the estimates presented in Table 4. All outcomes are calculated for a median worker (male, between 40 and 50 years of age, married with children, has 40 months of tenure, a previous monthly wage of 2.000 euros and works in construction in a firm with less than 100 employees.). The unobserved heterogeneity is subsequently integrated out over the estimated distribution.

Source: Own calculations using registration data from Statistics Netherlands on displaced workers.



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