Better protected, better paid: Evidence on how employment protection affects wages

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Abstract

This paper empirically establishes the causal effect of the employer’s term of notice on the wage level of employees. The term of notice is defined as the period an employer has to notify workers in advance of their upcoming dismissal. The wages paid during this period are an important element of firing costs and hence employment protection. To find a causal effect, I exploit the exogenous change in the term of notice that resulted from the introduction of a new Dutch law in 1999. Strong evidence is found that a longer term of notice leads to higher wages. In my sample, an additional month of notice increases wages by three percent, ceteris paribus.

Keywords: Employment protection, Wages, Fixed Effects, Treatment evaluation

JEL-classification: C23, J31, J38, J63

1 Introduction

Employment protection legislation (EPL) has been on the (European) political agenda for several decades and continues to be widely debated. On the one hand employers complain that they are incapable of adapting to economic circumstances because of high firing costs and on the other hand vulnerable groups of employees complain that the firing risk they face is too large. Policy-makers in the meantime have to decide upon an optimal level of protection. In order to make such decisions politicians need to know how different types of employment protection affect labor market outcomes. In order to provide such answers, a large economic literature on employment

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protection has developed.

Wages are central in this literature as the employment protection effect on wages is closely related to its effect on employment levels. How these two labor market outcomes are theoretically related depends on the type of employment protection under investigation, on the relevant labor market institutions and on which further assumptions the respective researchers makes. An efficiency wage theorist such as Lazear (1990) for example considers a competitive economy with individual wage-setting and firing costs that will be transferred to dismissed workers. In his model, wages will adjust downwards to take the firing costs into account and employment will not be affected. Alternatively, Bertola (1990) assumes central wage bargaining by a union who cares for incumbent workers only and a general turnover cost associated to dismissals. According to insider/outsider theory, employment protection will then bring unions to bargain for higher than competitive wages. As a result, firms will fire (and hire) fewer workers.

Empirically, only anecdotal evidence of the true relationship between employment protection and wages exists. This is partly because most empirical research has analyzed macro-data and composite employment protection indices, which introduces comparability issues and confounding factors into the estimations. This paper seeks to use a micro panel dataset to empirically establish the causal effect of a specific type of employment protection, namely the employer’s term of notice (ToN), on the wage level of employees. The term of notice is defined here as the amount of time an employer has to notify an employee in advance of her upcoming dismissal. Specific groups, notably older workers, are often protected by a longer term of notice. The legal term of notice is usually ignored in the empirical employment protection literature. This is unjust as a long term of notice corresponds to a large number of obligatory wage payments and hence is a substantial firing cost to the employer.

This paper exploits a 1999 policy change in the legal term of notice in The Netherlands to answer the causality question. The exogenous change in the term of notice is furthermore necessary to separate the age, tenure and term of notice effects on wages. Low-tenured workers benefited from the introduction of the law on flexibility and security as their employer’s term of notice increased but higher tenured workers experienced a shorter term of notice after the 1st of January 1999.

The remainder of this paper presents evidence of a strong positive causal effect of the term of notice on wages. It is nevertheless demonstrated that regressions that ignore the micro-econometric difficulties involved can overestimate this effect. Section 2 discusses the most important findings in the employment protection literature on wages. The econometric issues that complicate the identification of a causal effect are explained in Section 3. Section 4 then lays out the term of notice regulations in The Netherlands and the changes introduced in the law of flexibility and security (‘Flexwet’).
Section 5 explains the employed fixed effects methodology. The utilized data are discussed in Section 6 and results will be presented in Section 7. Section 8 concludes.

2 Literature

Before this section discusses the empirical literature on the effect of firing costs (and hence the term of notice) on wages, it introduces the theoretical literature on the impact of employment protection.

2.1 Theoretical literature

An extensive literature looks into the effects of firing costs on the labor market. Concerning wages, the predictions of what employment protection actually does vary greatly. Many of these differences result from considering different types of employment protection and different types of labor market institutions. I will explain most views in this section, although I do not pretend to be exhaustive.

Walter Oi published the seminal paper in the employment protection literature in 1962 as he was the first to model labor as a quasi-fixed production factor and labor costs as having a fixed component related to hiring and firing costs. Many authors followed in his footsteps by building partial equilibrium models of labor demand, meanwhile introducing different structures of the labor adjustment costs (e.g. Bentolila and Bertola, 1990). Wages are however exogenous in the greatest part of this literature. As the effect of employment protection on wages cannot be separated from the effect of employment protection on dismissals, I will however explain Bentolila and Bertola’s argument below.

Whether a profit-maximizing firm decides to fire a worker primarily depends on the productivity and wage of the worker\(^1\). When the difference between these entities is negative, an employer loses money and she will consider to fire the worker. It is costly however to adjust the number of employees downward because of firing costs.

Firing costs comprise of two elements: \textit{taxes} to be paid outside the job-worker pair and \textit{transfers} from the firm to the worker (Garibaldi and Violante, 2005, p.799). Legal costs associated with layoffs fall under the first type, whereas the term of notice and the severance pay fall under the second type of employment protection. The length of the term of notice, or the number of additional wage payments, partly determines the size of the transfer firing costs. When the gap between an individual’s wage and

\(^1\)This paper considers individual lay-offs. Individuals can be fired because of financial-economic or match-specific problems, say when there is a conflict between the employer and the employee. Although the latter probably plays a considerable role in observed lay-offs, this paper focuses on the financial firing rationale.
productivity is large, these costs are substantial. To illustrate the costs associated with the term of notice, I take a fifty year-old female worker from my sample employed at a firm for twenty years. Before 1999, her employer would have to notify her 18 weeks before an upcoming dismissal. If I assume that the fired worker was (demotivated and therefore) completely unproductive over that period, her employer would thus have lost on average fl. 16,208.

Getting back to Bentolila and Bertola’s argument: attracting a new employee in the future will also be costly to the employer because of hiring and training costs. Hence it could be profitable to defer the irreversible decision to fire a worker in order to circumvent adjustment costs. The firm will indeed do so when either the probability of a productivity change for the better or the costs of hiring and firing are sufficiently large. According to the adjustment costs literature, higher firing costs, e.g. a longer term of notice, thus lower the propensity to fire a worker when wages are fixed. Note that the overall impact of employment protection on employment levels is unclear however, as the propensity to hire also goes down.

As mentioned already, most of the employment demand literature takes wages to be exogenous. One exception is Bertola (1990) who draws from the insider-outsider literature (see Lindbeck and Snower, 2001, for an overview of this literature). In short, insider-outsider theory divides the labor market into insiders - incumbent workers who benefit from employment protection - and outsiders - those who do not benefit such as the unemployed and temporary workers. Because it is difficult to get rid of them, insiders have some bargaining power in the wage process and hence demand higher than competitive wages (for a formal model, see Lindbeck and Snower, 1986).

In his paper, Bertola looks at how employment protection affects wages under different wage setting institutions. First, he investigates labor demand and endogenous wages when wage negotiations take place at the individual level. He finds that under certain assumptions total received wages might not be affected, although outsiders might offer to work for a very low wage in order to become an insider and although insiders might afterwards rise wage demands above the competitive level. This would be because, in a competitive economy, these two effects cancel out. Second, Bertola assesses wages when there is a wage setting union that cares for everyone in the labor market. Also in this case, he concludes that lifetime wages would remain unaffected. Only in the instance of unions who solely represent working members does employment protection increase total labor income for insiders indefinitely.

The idea that a country’s wage-setting institutions influence the causal effect of employment protection on wages is also exploited in a search and matching model framework by Garibaldi and Violante (2005). The authors built a model with endogenous wage setting behavior by a monopolistic union. Garibaldi and Violante (2005) stress that in such a setting the introduction of an exogenous firing cost has two opposing effects on the workers’
desired wage level: workers would like to have a higher wage (*the income effect*) but do not enjoy the accompanying higher probability to get fired (*the job security effect*). Whenever the elasticity of the firm’s firing probability to wages is low enough, workers will demand higher wages when they are better protected.

Efficiency wage theorists shed a different light on firing costs and wages. Lazear (1990) wrote an influential paper on employment protection, arguing that firing costs do not necessarily affect hirings and firings. He reasons that in a flexible labor market, in the absence of contract and market restrictions, *transfer* employment protection such as the term of notice could be undone by efficient wage setting behavior between workers and firms. He predicts that in a competitive economy with decentralized wage setting, firing costs drive wages down, up to the point where the severance pay and the wages paid during the term of notice can be seen as a delayed payment.

Lazear’s negative effect of employment protection on wages is replicated by Pissarides (2001), but the latter takes the workers point of view. In his search and matching model the term of notice is endogenous and generates lower wages because risk averse workers accept a lower income during the productive period of a job, in order to receive a higher income during unproductive times. Bertola and Rogerson (1997) adapt a similar reasoning. If workers are risk-averse and value job security, they will accept lower wages in exchange for more employment protection.

Because the literature above thinks about workers as having fixed or at least exogenous productivity, it leaves out another important route through which employment protection positively affects wages. More employment protection namely enhances the incentives for a firm to invest in a worker and for a worker to invest in firm-specific human capital. Nickell and Layard (1999) briefly describe this effect. These human capital investments could pay off in terms of higher productivity and higher wages. Arulampalam, Booth and Bryan (2004) present some indirect empirical evidence that employment protection does increase training of employees. They find that those on fixed term contracts take up less training than those on permanent contracts.

To summarize the theoretical insights so far: On the one hand the term of notice could increase wages. Two main arguments are discussed. First, insider-outsider theory predicts that employment protection improves insiders’ bargaining position when there is some degree of centralized wage bargaining. Second, employment protection could stimulate human capital investments and hence increase individuals’ productivity. On the other hand, the term of notice could decrease wages. Three arguments are provided. First, the term of notice, being a transfer component of employment protection, could be compensated by lower wages in a competitive economy with individual wage-setting. Second, if the term of notice is endogenous, workers are willing to accept a lower wage in order to have the job security
associated with a term of notice. Third, employment protection might not induce workers to increase their wage demands out of fear of the associated increase in firing probabilities. The latter two arguments hold even in a more centralized wage-setting environment.

The most appropriate theories for my empirical study are the ones involving some market imperfections and moderate centralized wage-setting. Lazear’s argument is hence not likely to hold in the Dutch economy, in which wages are negotiated over by industry employers organizations and a small number of labor unions. For more information on wage setting in The Netherlands see Wallerstein et al. (1997). Even excluding the efficiency wage argument there are however still opposing predictions on the causal effect of employment protection on wages. The data will have to judge which of these hold.

2.2 Empirical literature

Up to date, the empirical literature has experienced difficulties in establishing a clear relationship between firing costs and wages. Some of the papers discussed in the previous subsection do attempt to present empirical evidence of their models. However, the authors only provide anecdotal evidence of their theory at best, mainly because most of them use macro-data and aggregate indices of employment protection that are hard to compare. The estimates are furthermore troubled by confounding factors. Other than his theoretical model predicts, Bertola (1990) for example presents some evidence that the productivity wage gap is actually lower in countries with stricter employment protection.

The empirical wage setting literature in its turn often ignores employment protection as it is so hard to quantify. See for example the cross-country study of industry wage differentials by Holmlund and Zetterberg (1991) and the establishment-level study by Blanchflower, Oswald and Garrett (1990). Both papers do suggest substantial insider wage gains.

An interesting firm-level study by Autor, Kerr and Kugler (2007) does include employment protection, i.e. tax employment protection, explicitly. The paper exploits U.S. state variation in the adoption of wrongful-discharge protections in order to study firm-level productivity differences. The authors find that the introduction of these laws coincided with a rise in capital investment, non-production worker employment and hence measured a labor productivity increase. Whether these effects can be causally linked to the wrongful-discharge protection remains to be seen. Even so, this study fails to measure the impact of employment protection on individual workers.

The use of micro-data in the empirical employment protection literature, which seems to be a necessary prerequisite for identifying causality, is unfortunately limited. The fact that wages are usually very heterogeneous across workers of different ages, tenure, education and hierarchy provides
another rationale for individual-level empirical analysis. The only micro-study on employment protection and wages that I am aware of is written by Leonardi and Pica (2007). They apply a regression discontinuity design to study entry wages and the tenure wage profile by exploiting an Italian policy change. The authors find no causal effect of severance payments on entry wages. This policy change in employment protection legislation was targeted at small firms only, which raises questions about the generality of the conclusions.

My paper is, as far as I know, the first to identify a strong positive causal relationship between transfer employment protection and wages using a representative micro panel dataset. One of the many advantages of this empirical strategy is that it allows me to control for other effects of employment protection such as on dismissals and on hours worked. This is because I follow the same individuals over different years and if applicable over different jobs.

3 Causality

In this paper I would like to find out what is the relationship between the term of notice and wage rates. Merely reporting the association between the two variables is not enough, I am interested in the causal effect of the term of notice, which is not trivial to identify. However, several econometric difficulties trouble the identification of a causal effect of the term of notice.

All issues arise from the fact that for each employee the term of notice, at least in The Netherlands, is determined by a fixed formula of tenure and age. Hence, the term of notice is a deterministic, non-linear function of these two variables. In fact, apart from calendar time (which determines under which legal framework a worker is fired) nothing else influences the employer’s term of notice.

The first econometric problem that I encounter is that of the endogeneity of tenure. Tenure is an endogenous variables, because unobservable characteristics such as work attitude and ability influence tenure as well as wages. As a result of the fixed formula that calculates the term of notice from tenure this endogeneity stains the term of notice variable as well. Running a regression of wages on the term of notice will thus result in a biased and inconsistent coefficient for the term of notice as changes in the term of notice will be associated with changes in the time-invariant individual specific error term. The described wage model can be seen in equation 1, where $X$ refers to personal characteristics, $Z$ to employer and job characteristics, $\varepsilon_{it}$ to an i.i.d error term and $\upsilon_i$ to the individual-specific time-invariant error term.

$$Wages_{it} = h(ToN_{it}(\upsilon_i), X_{it}, Z_{it}) + \upsilon_i + \varepsilon_{it}$$

$$E\{\upsilon_i + \varepsilon_{it}|ToN_{it}\} \neq 0$$

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The equation above shows that the wage model violates the important econometric assumption of conditional mean independent error terms. The endogeneity of tenure and the term of notice can and will be addressed by applying a fixed effects type estimator. Section 5 further explains the applied methodology.

Unfortunately, in the wage model the fixed effects approach doesn’t result in unbiased estimates of the term of notice coefficient. An extreme multi-collinearity problem arises when the important covariates tenure and age are included in $X_{it}$. This econometric problem is another consequence of the fixed formula for the term of notice. The marginal effect of the term of notice on wages can thus never be determined ceteris paribus. This is because when the term of notice changes from one year to the next this coincides with a change in tenure and age. In a traditional regression model, it is therefore hard to know what is captured in the term of notice coefficient. This multi-collinearity can be demonstrated in two ways. First, the pairwise correlation between tenure and the term of notice in my sample before 1999 ($N=10,549$) is 0.88. Second, the variance inflation factor (VIF)$^2$ of the term of notice in the wage model is larger than 10 (see table 1 in Section 7).

To nevertheless answer the research question, one can exploit an exogenous change in the term of notice that does not coincide with a change in tenure and age. To identify a causal relationship between the term of notice and wages this paper therefore exploits the exogenous policy change described in Section 4, the introduction of the law on flexibility and security in The Netherlands. A fixed effects estimation remains necessary even when exploiting this exogenous policy change as the ‘selection’ into how the new law changes the term of notice depends again on tenure and is hence endogenous.

### 4 Term of notice

The policy change that will be exploited in the fixed effects method below is the introduction of the law on flexibility and security (the ‘Flexwet’) in The Netherlands on January 1st, 1999. This law intended to diminish differences in the labor market between temporary and permanent workers. On the one hand, employees with temporary contracts received better legal protection than before. On the other hand, employees with permanent contracts lost some rights. The main change for tenured employees was the adaptation and simplification of the legal formula for the term of notice. See Heerma van Voss (1998) or Smitskam and Kronenburg-Willems (2000) for a detailed

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$^2$Variance inflation factors ($\frac{1}{1-R^2}$) can be used to track down multi-collinearity problems. $R^2$ refers to the multiple correlation coefficient between variable $j$ and all other independent variables. A VIF over 10 indicates severe collinearity of higher orders between the specified variable and the remaining regressors.
description of the new law.

There are two paths to dismissal in The Netherlands, and the legal term of notice only applies to the labor office path. This is a relatively slow route that doesn’t require severance payments. The labor office has the discretion to refuse an application, but only does so in a small percent of the cases (i.e. five percent in 2002). Mainly individual lay-offs in small- and medium sized firms and collective lay-offs are dealt with by the labor office. The other route, through court, is faster and involves substantial severance payments. The cantonal court judge in principle always allows a lay-off but adapts the severance payment to the specific firing rationale (i.e. a worker receives more if the employer could have done more to prevent the lay-off).

An employer is free to choose a dismissal path and the labor office path is thus a credible threat to all workers. Furthermore, nothing changed in the court procedure over the analyzed period. This means that the employer’s term of notice and the policy changes to it are relevant to all employees on a permanent contract.

The calculation of the term of notice before the 1st of January 1999 (old-ToN) was as follows. For every year of tenure an employer had to add a week to the notice period, with a maximum of thirteen weeks. On top of this, workers received an extra week of notice for each year they had worked while being forty-five or older, also with a maximum of thirteen weeks. So, the employers of two workers with identical tenures (say fifteen years) but different ages (say forty and sixty) faced different terms of notice (in this case thirteen weeks and twenty-six weeks).

The legal term of notice after the 1st of January 1999 (new-ToN) consists of two elements: a new formula for newly-hired employees and a transitory arrangement for workers already employed at the introduction of the ‘Flexwet’. The new formula that applies to employees hired after the 1st of January 1999 does not depend on age and accommodates fewer term of notice lengths. For workers employed in between zero and four years employers face a term of notice of one month. When a worker is employed between five and nine years, employers have to notify her two months in advance. If a worker’s tenure is between ten and fourteen years, her employer will have to notify her three months in advance. Any tenure longer than fourteen years results in an employer term of notice of four months. In addition, the new law allows employers to deduct one month if they have strictly followed...
the rules, given that the minimum term of notice remains one month. This subtraction is allowed in almost all cases (i.e. ninety-six percent in 2002).

The ‘Flexwet’ also includes a transitory arrangement for those workers that were already employed by the 1st of January 1999. For these employees, the employer picks the longest term of notice out of the old-ToN calculated for the tenure and age situation on the 1st of January 1999 and the new-ToN for the tenure and age at the time of firing. Subsequently one month can be deducted if the employer obliges all rules. So, the employers of two workers with identical tenures (say fifteen years) and age (say sixty years) but fired at different times (say at the 1st of February 1999 and at the 1st of February 2002) face different terms of notice (in this case five months and four-and-a-half months).

The relationship between the old and new term of notice thus depends on age and tenure of the worker and time. Figure 1 shows the old- and new-ToN for the respondents in my dataset over tenure and selected ages. Wherever there are multiple terms of notice visible for an age-tenure combination this is because of time differences.

The graphs for the thirty-year and forty-year old worker are identical, the latter only has a larger domain as no thirty-year old is observed with
a tenure over seventeen years. When comparing the old- and new-ToN for young workers with a tenure below five years, the new term of notice is longer than before. For young workers with a tenure above fourteen years the old and new term of notice are the same. Young workers with a tenure in between - from five to fourteen years - experience a new term of notice that is shorter than the old-ToN.

The graphs for the fifty-year and sixty-year old worker share important characteristics. For older workers (i.e. from forty-six years onwards) with a tenure below three years the new term of notice is longer than before. This threshold is lower for older workers as the old age reward leads to a higher old term of notice slope\(^\text{5}\). The term of notice of older workers with a tenure of three years and over is shortened in the new scheme. The extent of the difference depends on age and tenure of the worker and time.

Although the length of the term of notice that applies in the labor office path is set out by law, the ‘Flexwet’ made it possible to agree upon a different term in a collective wage agreement. For the analysis in this paper it is important to know to what extent this occurred\(^\text{6}\). Combining information from the Ministry of Social Affairs and Employment and my own investigation in the matter I find that after the 1st of January 1999 the legal term of notice applied to eighty percent of workers\(^\text{7}\). If the deviation from what is written down in the law is orthogonal to the type of worker in my sample, I can treat the bias resulting from measurement error as an attenuation bias. This bias will drive the coefficient of the term of notice down. Any significant results that I find will hence be underestimating the true causal effect of the term of notice. In the Smits and Samadhan report the distribution of deviations over sectors seems rather equal. Therefore, and because it is hard to know which agreement specifically applies to which worker, I abstract from the deviation in the collective wage agreements and assume that the legal term of notice applies to everyone.

For longer tenured employees the introduction of the law on flexibility and security thus resulted in a lower term of notice, but for shorter tenured workers the term of notice increased. This variation in the direction of the

\(^{5}\)For 46 year-old workers the threshold is actually four years of tenure.

\(^{6}\)Smits (2000) and Smits and Samadhan (2002) report that the one month deduction, with a minimum term of notice of one month, prevailed in practically all agreements settled after the 1st of January 1999.

\(^{7}\)About twenty percent of the workers do not fall under any sort of collective agreement and hence the legal term of notice will always apply to them. The other eighty percent of workers do fall under a collective agreement. I checked half of the collective wage agreements that were declared to hold for all workers in the relevant sector between 1999 and 2002 and found that roughly seventy percent of these featured the term of notice set out in the ‘Flexwet’. In sixteen percent of the cases a term of notice calculation that is related to age and tenure still existed. In fourteen percent of the analyzed collective wage agreements I found a constant term of notice. If I assume that the distribution of workers is equal across the different agreements I conclude that eighty percent of workers on a permanent contract face the legal term of notice after January 1st 1999.
policy change will prove useful in identifying the causal effect of the term of
notice on wages in Section 7.

5 Methodology

As explained in Section 3 I apply a fixed effects (FE) method to assess
whether the term of notice can be causally linked to lay-offs and wages. The
FE method eliminates the problem of endogeneity of tenure and the term
of notice. By exploiting the 1999 policy change in the term of notice the
extreme multi-collinearity between the term of notice, age and tenure will
furthermore be taken care of.

The 1999 policy change described in the previous section satisfies cer-
tain necessary traits. First, the introduction of the new law has differential
effects across individuals; this makes it possible to separate time and treat-
ment effects. Section 4 explains that the new law increased the term of
notice for low-tenured individuals and decreased the term of notice for high-
tenure individuals.

Second, selection into a particular treatment group (i.e. into what ef-
flect the policy change has on one’s term of notice) can fully be controlled
for, as the impact of the policy change depends only on age and tenure.
By controlling for these two entities and by removing the individual unob-
served heterogeneity term the potential selection issues can be overcome.
Note that I assume that selection into low or high tenure does not depend
on the potential, individual impact of the policy change. This makes sense
as I believe it impossible that people quit and start a new job, just for the
sake of benefiting from a policy change in the term of notice. It should
be remembered that high tenured individuals experience a higher level of
employment protection in general, although the policy change does lower it
somewhat. It is therefore irrational to exchange this better protection for
an improving, but still worse protection.

Third, as selection into the treatment depends on observable character-
istics only, I can even control for differential wage trends for the groups who
are affected by the policy change in a different way. Economic circumstances
and other policy changes could for example have a differential impact on the
wage trends for low- and high tenured individuals over the analyzed period.
By adding interaction terms between the period after the policy change and
a dummy for tenure over two years and a dummy for age over 45 I control
for the different time trends. Note that after the policy change the term
of notice for all workers with a tenure below three years increased and the
term of notice for all workers with a tenure over two years older than 45
decreased. In table 2 in Section 7 I show that the wage trends for these
groups are indeed very different.

The causal effect I’m interested in can thus be obtained as the marginal
effect of the term of notice variable in a regression of wages on the term of notice, tenure, age groups, time dummies, a dummy for tenure above two years, a dummy for age over 45, the interactions described above and several covariates. In order to do so, equation 2 is estimated as a fixed effects linear regression model using the log of the hourly wage rate as the dependent variable. In this equation $x_{it}$ refers to all other controls and covariates.

$$Wages_{it} = \alpha + \beta_{ToN} * ToN_{it} + \beta_2 * tenure_{it} + x_{it}' \gamma + \nu_i + \varepsilon_{it}$$ (2)

6 Data

Six waves of the Dutch Socio-Economic Panel (SEP), a household survey, are used for the empirical analysis of the research question (1996-2001). This longitudinal dataset has been collected annually by Statistics Netherlands from 1984 to 2002. The SEP has been collected every April. Although the same individuals are observed multiple times in my sample, I do not have a balanced panel. I observe 57 percent of the individuals both before and after the policy change, 19 percent only before and 23 percent only after.

I use all available waves before and after the 1999 policy change that contained information on the type of contract a worker was on and that contained comparable wage information. Only employees with a permanent contract are included in the sample. This is because only for tenured workers employers face a legal term of notice.

The dependent variable in the wage regressions is the logarithm of the hourly wage rate. All observations below the 0.1th percentile (fl. 1.15) and above the 99.9th percentile (fl. 263.12) are dropped, because wage rates in these areas seem highly unlikely. Figure 2 shows a kernel density estimation of the cleaned variable, which is symmetrically distributed. The average wage rate is 31.06 guilders per hour (s.d. 14.73). Those with a tenure above two years earn more on average (fl. 32.61, s.d. 13.97) than those who are new to their employer (fl. 26.79, s.d. 15.87). As expected, those over 45 earn more on average (fl. 35.69, s.d. 16.95) than their younger counterparts (fl. 29.16, s.d. 13.25).

Figure 3 provides distributional information on the terms of notice in my sample before and after the policy change. Before 1999 the average term of notice was 2.0 months (s.d. 1.5), whereas it was 1.8 months (s.d. 1.1) after the introduction of the ‘Flexwet’. It can be seen in the graph that the new law increased the minimum term and decreased the maximum term. The visible spikes in the center of both graphs result from the 13 weeks maximum term of notice in the old calculation for those under 45.

Figures A-2 and A-3 in the appendix show histograms of the ages and

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*Excluding the individuals who are only observed at one side of the policy change does not alter the results in Section 7. The estimated term of notice coefficient equals 3.0 as well (N=16,683).
Figure 2: Kernel density estimation of the hourly wage rate (N=21,080)

Figure 3: Histograms of the new and old term of notice (N=21,080)
tenures of the workers in my sample. The average age is 39.5 years (s.d. 9.7) and the average tenure is 9.9 years (s.d. 8.9). The descriptive statistics of these and other independent variables can be found in table A-1 in the appendix.

The regressions presented in the next section include various control variables such as hours worked, dummies for the years 1997 to 2001, a dummy for tenure over two years and a dummy for age over 45. The lagged wage rate is not included as it doesn’t explain a significant proportion of current wages.

7 Results

This section contains the results of the empirical analysis. Before I present the estimation results of the fixed effects method explained in Section 5, I discuss the estimates for the effect of the term of notice in potentially biased regressions. The results of the first part of this exercise can be found in table 1.

In the first column coefficients and standard errors are presented for a pooled OLS regression on all observations before the 1999 policy change. The third column presents similar results for the period after the introduction of the ‘Flexwet’. The time periods are separated as different rules governed the term of notice calculation. Both regressions suffer from all possible econometric problems; endogenous tenure, an endogenous term of notice and multi-collinearity between the term of notice and tenure. The latter problem is most severe in the first column as the VIF score of 10.98 suggests. This can be explained by the fact that before the policy change the formula to calculate the term of notice was most simple. Afterwards low and high tenured individuals fall into different schemes. In both biased regressions I find a significant positive effect of the term of notice on wages. The estimated effect is largest before 1999.

In the second and fourth column of table 1, the endogeneity problem is solved by estimating a fixed effects model for both time periods. Applying a FE method is highly justified as the proportion of the error term that is time-invariant equals about ninety percent for both time periods. In both periods there is positive selection into high tenure; i.e. the time-invariant error term that is correlated with tenure drives both the tenure coefficient as well as the term of notice coefficient up. This problem is most visible in the period before the policy change. In the second column the significant effect of the term of notice on wages has vanished completely. Not controlling for the endogeneity of tenure can hence overestimate the effect of the term of notice on wages.

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9The standard errors in the presented pooled OLS regressions are calculated using a cluster-robust variance matrix.
Table 1: Coefficients and standard errors of biased wage models for different time periods (I: before 1999, II: after 1-1-1999). Dependent: log of hourly wage rate.

<table>
<thead>
<tr>
<th>Term of notice (months)</th>
<th>(1) OLS</th>
<th>(2) FE OLS</th>
<th>(3) OLS</th>
<th>(4) FE OLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term of notice (months)</td>
<td>0.0455*** (0.0111)</td>
<td>-0.0079 (0.0108)</td>
<td>0.0375** (0.0125)</td>
<td>0.0373*** (0.0113)</td>
</tr>
<tr>
<td>Tenure (years)</td>
<td>0.0031* (0.0014)</td>
<td>0.0002 (0.0018)</td>
<td>0.0027 (0.0014)</td>
<td>-0.0036* (0.0016)</td>
</tr>
<tr>
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<td>10,549</td>
<td>10,531</td>
<td>10,531</td>
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<td>4,512</td>
<td>4,829</td>
<td>48,29</td>
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<td>Aic</td>
<td>8,999</td>
<td>-13,702</td>
<td>9,786</td>
<td>-13,447</td>
</tr>
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<td>I</td>
<td>I</td>
<td>II</td>
<td>II</td>
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<tr>
<td>Endogeneity</td>
<td>Present</td>
<td>Solved</td>
<td>Present</td>
<td>Solved</td>
</tr>
<tr>
<td>Rho</td>
<td>-</td>
<td>0.910</td>
<td>-</td>
<td>0.899</td>
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<td>Multi-collinearity</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
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<tr>
<td>VIF Term of notice</td>
<td>10.98</td>
<td>-</td>
<td>7.16</td>
<td>-</td>
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</table>

Standard errors in parentheses

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

The regressions include a constant, hours worked, year dummies, eight five-year age bracket dummies, a dummy for tenure over two years and a dummy for age over 45.
In table 2 the observations of both time periods are used. Hence, multicollinearity problems can no longer bother the estimates. The first column however still contains biased coefficients, as I do not control for different time trends for the high tenured and the high aged. The second column of table 2 however does report the ‘true’, unbiased causal effect of the term of notice on wages.

When ignoring the fact that wage trends have been different for low and high tenured and young and older workers over time, I find a huge significant effect of the term of notice on wages. The results in column one suggest that an additional legal month of notice increases the wage rate, ceteris paribus, by 7.2 percent. This is an overestimation of the causal impact of the term of notice as the second column indicates. In this column I add the interactions between the policy change period and a dummy for having tenure of two years and a dummy for being older than 45. These thresholds were chosen because all workers with a tenure below 3 years experienced a higher term of notice after the policy change and all workers above 45 years with a tenure above two years experienced a lower term of notice.

Adding these interactions has a large impact on the estimates. In column two, the marginal effect of the term of notice on wages diminishes from 7.2 percent to 3.0 percent. Apparently, the economic circumstances after the introduction of the 1999 policy change and other policy changes that coincide with it were such that these lowered the relative wages of higher tenured and older workers. As the 1999 policy change in the term of notice affected these groups negatively as well, ignoring the differential wage trends overestimates the effect of the term of notice on wages.

Focusing on the unbiased results in the second column of table 2 a clear positive empirical relationship between the term of notice and the wage level is emerging. The marginal effect of an additional month of an employer’s notice equals 3.0 percent of the wage rate and is highly significant at the one percent level. For an average male in my sample, aged 40 with 11 years of tenure, who experienced a drop in term of notice from 2.5 months to 2 months because of the 1999 policy change, this equals a loss in wage rate of 1.6 percent. On a yearly basis this man, who worked 40 hours a week and earned 37 guilders an hour in 1998, therefore lost 1,256 guilders (i.e. 570 euros) because of the change to his employer’s term of notice.

Where theory is ambiguous on the sign of the association between the term of notice and wages, my data leaves no doubt. A higher term of notice causally drives wages up, in contrast to the empirical findings of for example Leonardi and Pica (2007). Consequently, a lower term of notice drives wages down.

To check the robustness of these results several additional models were estimated which estimates are displayed in table A-2 in the appendix. All three columns present estimates of models which are similar to the unbiased
Table 2: Coefficients and standard errors of wage models for combined time periods (I: before 1999, II: after 1-1-1999). Dependent: log of hourly wage rate.

<table>
<thead>
<tr>
<th>Term</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term of notice (months)</td>
<td>0.0715***</td>
<td>0.0303***</td>
</tr>
<tr>
<td>Tenure (years)</td>
<td>-0.00867***</td>
<td>-0.00300**</td>
</tr>
<tr>
<td>Dummy for tenure over two years</td>
<td>0.0150*</td>
<td>0.0604***</td>
</tr>
<tr>
<td>Interaction of tenure over two years and introduction new law</td>
<td>-0.0864***</td>
<td>(0.0109)</td>
</tr>
<tr>
<td>Dummy for age over 45 years</td>
<td>-0.0328***</td>
<td>-0.00578</td>
</tr>
<tr>
<td>Interaction of age over 45 years and introduction new law</td>
<td>-0.0322***</td>
<td>(0.00908)</td>
</tr>
</tbody>
</table>

<table>
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</tr>
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<td>Individuals</td>
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<td>5977</td>
</tr>
<tr>
<td>Aic</td>
<td>-17631.4</td>
<td>-17726.8</td>
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<tr>
<td>Period</td>
<td>I+II</td>
<td>I+II</td>
</tr>
<tr>
<td>Endogeneity</td>
<td>Solved</td>
<td>Solved</td>
</tr>
<tr>
<td>Rho</td>
<td>0.891</td>
<td>0.892</td>
</tr>
<tr>
<td>Multi-collinearity</td>
<td>Solved</td>
<td>Solved</td>
</tr>
<tr>
<td>Time trend problem</td>
<td>Present</td>
<td>Solved</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

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

The regression includes a constant, hours worked, year dummies and eight five-year age brackets.
model from the second column of table 2. In the model in the first column however, the observations between April 1998 and March 1999 are excluded. This was done to ensure that the causal effect of the term of notice on wages is not the result of wage setting behavior anticipating the January 1999 policy change\(^{10}\). As the marginal effect of the term of notice in the first column is even larger than the previously mentioned 3.0 percent, I conclude that this is not the case. In column two and three I separate the sample in male and female workers. Comparing the marginal effects of the term of notice for these two groups, I conclude that the term of notice has an equal size impact on wages of both men and women.

I thus find evidence that the employer’s term of notice has a strong positive causal effect on wages. However, the effect of the term of notice is overestimated when the econometric issues involved are neglected. Nevertheless, a three percent higher wage rate for each additional month of notice is a relevant and substantial side-effect of this type of employment protection.

8 Conclusion

This paper establishes the causal effect of the employer’s term of notice on the wage level of employees. The legal term of notice is defined as the amount of time a firm is required to notify a worker in advance of her upcoming dismissal. As such, the term of notice is an important component of firing costs and thus of employment protection.

In order to find a causal link, I performed a fixed effects estimation exploiting an exogenous policy change in the term of notice. This procedure corrects for the endogeneity of tenure and for the extreme multi-collinearity between age, tenure and the term of notice. The latter problem arises because age and tenure are the only inputs in the legal formula that calculates the term of notice. The relevant policy change is the 1999 introduction of the law on flexibility and security (‘Flexwet’) in the Netherlands. This law altered the calculation of the legal term of notice such that the term of notice of low tenured individuals went up and the term of notice of high tenured individuals went down. Six waves of the Dutch Socio-Economic Panel (SEP) were used for the empirical analysis (1996-2001) in which a fixed effects linear regression model is estimated using the logarithm of hourly wages.

The unbiased econometric model in column two of table 2 unveils a very significant, positive causal effect of the term of notice on the wage rate. An increase in the term of notice of one month leads to a three percent higher hourly wage rate. One thing is thus for certain: the arguments presented in Section 2 describing a negative effect of employment protection on wages

\(^{10}\)Although I do not find such anticipation, note that such behavior would not contradict but rather emphasize a causal effect of the term of notice.
are incorrect in the analyzed context. This was to be expected for Lazear’s (1990) efficiency wage argument as the Dutch labor market institutions do not resemble his competitive model with individual wage-setting. The same could be said for Pissarides’ (2001) argument about an endogenous term of notice as the term of notice is decided upon by policy-makers.

The theoretical literature provides two plausible reasons for a positive effect of employment protection on wages. First, insider/outsider theory suggests that the bargaining position of insiders is enhanced by better protection when unions only represent incumbent workers. In wage negotiations this could then drive wages up. Second, employment protection creates more incentives for firms to invest in workers and for workers to invest in firm-specific human capital. These investments will then lead to higher productivity and higher wages.

More empirical research has to be conducted to decide which of these positive effect theories is best describing reality. In my empirical strategy, I cannot distinguish between the two. To do so, more detailed information on individual employees will be needed. Longitudinal micro-data reflecting individual productivity could address the issue directly. As this data is difficult to obtain, a panel of firm educational investments in their workers could be analyzed to indirectly find an answer.

For policy recommendations it is crucial to know what effect on wages is more important: the bargaining or the investment effect. If the wage bargaining argument is stronger, employment protection creates rents for incumbent employees which policy-makers will want to avoid. If however the investment argument holds, employment protection improves the quality of labor which is what policy-makers are seeking. In any case, policy makers should be aware of the positive side-effect of the term of notice on wages. Just thinking about various types of employment protection in terms of employment does not cover their full economic influence.

References


Figure A-1: The ratio of lay-offs through the labor office over the total number of lay-offs (Source: Ministry of Social Affairs and Employment, 2003)

Figure A-2: Histogram of ages (N=21,080)

Figure A-3: Histogram of tenure (N=21,080)
Table A-1: Descriptive statistics of all variables (N=21,080)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.d.</th>
<th>Min</th>
<th>Max</th>
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</thead>
<tbody>
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<td>Log gross wage rate (per hour)</td>
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<td>0.434</td>
<td>0.152</td>
<td>5.544</td>
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<tr>
<td>Term of notice (months)</td>
<td>1.945</td>
<td>1.315</td>
<td>0.231</td>
<td>6.000</td>
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<tr>
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<tr>
<td>Age 35-39</td>
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<td>Age 55-59</td>
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<tr>
<td>Hours worked (per week)</td>
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<th>(2) FE OLS</th>
<th>(3) FE OLS</th>
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<tbody>
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<td>0.0281*** (0.00779)</td>
<td>0.0307* (0.0130)</td>
</tr>
<tr>
<td>Tenure (years)</td>
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<td>-0.00235* (0.00109)</td>
<td>-0.00382 (0.00214)</td>
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<tr>
<td>Dummy for tenure over two years</td>
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<td>0.0556*** (0.00952)</td>
<td>0.0690*** (0.0151)</td>
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<td>Interaction of tenure over two years and new law</td>
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<td>Dummy for age over 45 years</td>
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<td>-0.0363** (0.0118)</td>
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<td>-0.0117 (0.0176)</td>
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<td>I+II</td>
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<td>Women</td>
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<td>Rho</td>
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<td>0.903</td>
<td>0.840</td>
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<td>Time trend problem</td>
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<td>Solved</td>
<td>Solved</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

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

The regression includes a constant, hours worked and year dummies