FRINGE ATTRACTION.
COMPENSATION POLICIES, WORKER TURNOVER AND FIRM PERFORMANCE

by

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ABSTRACT

Employers' single-most popular justification in Norway why they provide fringe benefits is that these are important for recruitment and retention of workers. This paper applies worker quit regressions to Norwegian linked employer-employee data to identify strong negative *causal* impacts of fringe benefits and wages on worker turnover. Workers evaluate benefits higher than similar amounts in money wages. Reduced back-loading of compensation, makes poaching of workers by competing firms, easier. By changing jobs workers achieve higher money wages and fringe benefits values, but benefit values more so. Firms providing relatively more benefits as part of workers' compensation are more productive.

Keywords: fringe benefits, worker turnover, productivity, duration and GMM-analyses.

JEL-codes: J32, J41, J63, C23, C41

1. Introduction

Fringe benefits – non-wage components offered in the job contract – are becoming increasingly popular as parts of firms' compensation schemes. In the United States, during the last 30-40 years the provision of fringe benefits as per cent of total compensation has doubled.[1] In Norway 1995 29.5 per cent of the Norwegian establishments reported to the tax authorities that fringe benefits were given as part of workers' compensation. Seven years later, in 2002, more than 57 per cent of the establishments provided fringe benefits as part of their compensation schemes. Certain groups of workers received fringe benefits valued more than 5 times as much in 2002 as compared to that of 1995. The central tenet in this paper is thus that employers provide job contracts comprising several elements, whereof the wage is just one element (but not necessary the least). Workers care about these elements, and they all matters (although to a different degree) when workers choose where to work.

Due to the increasing prevalence of fringe benefits, it is important to understand workers' preferences for these benefits and why firms provide such benefits. The previous literature on fringe benefits has particularly focused on issues related to employer-provided health insurance and pension schemes (see Madrian [1994], Even and Macpherson [1996], Kapur [1998], Dey and Flinn [2005], Royalty [2000a, 2000b], Gilleskie and Lutz [2002], Olsen [2002], Ippolito [2002]), and tax reasons (Long and Scott [1982], Royalty [2000a]). Less attention has been focused on gender discrimination issues (Carrington, McCue and Pierce [2002]), on providing a general understanding of why firms provide different fringe benefits (Oyer [2007]) and on firms' compensation policies and worker turnover issues (Dale-Olsen [2006a]).[2]

Linked employer-employee data from 1995 to 2003 comprising all workers and establishments in Norway and questionnaire information from 2003 provide a rich source of information,

[1] From the sixties to the nineties it increases from 4.9 percent to over 10 percent. Woodbury [1983] reports total compensation comprises 4.9 per cent benefits in 1966 using BLS-data. Hashimoto [2000] indexes the 1966-figure as 100. The index in 1995 has increased to 174.1 and 212.45 for legally required and voluntary benefits, respectively.

[2] For comprehensive studies of fringe benefits with an overall perspective, see, for example, Ehrenberg [1971], Woodbury [1983] and Alpert and Woodbury [2000].

and allow me to extend the current literature along several important dimensions. Firstly, by exploiting changes in the income taxation legislation of workers and the pay-roll tax facing employer it is possible to identify a *causal* impact of fringe benefits on worker turnover. While Dale-Olsen [2006a] identified strong negative impact of wages and fringe benefits on worker turnover (even contingent on individual heterogeneity), no attempt in this study was conducted to identify a causal impact.[3]

Secondly, I provide evidence on how individual back-loading of wages and fringe benefit values affect turnover, and thus test, admittedly crudely, one of the predictions from the recent development within the equilibrium search literature. The main theoretical motivation of the paper is found in the Hwang, Mortensen and Reed [1998]-model (from here on defined as the HRM-model) which embed hedonic wages in the prototypical equilibrium search model. The HMR-model has, however, yet to be extended to incorporate compensation-tenure contracts. Burdett and Coles [2003] embed wage-tenure contracts in the equilibrium search framework, and make predictions regarding how the possibility of poaching other employers' workers changes with the wage-tenure contract. Reduced back-loading of wages provides firms with greater incentives to raise their starting wages and thus poach even long-tenured workers using on-the-job search. This contrasts the predictions of Stevens [2004]. By studying how worker turnover is affected by wage and fringe benefit growth, my study brings empirical evidence on the wage-tenure contract models of Burdett and Coles and of Stevens. My study supplements the study of Barth and Dale-Olsen [1999] on establishments' wage profiles and worker turnover, and is related to Abowd, Kramarz and Roux [2006]' very comprehensive study on wages and mobility using French matched worker-firm data.

[3] Since Rosen [1974], a rich literature has developed on how to empirically identify hedonic prices, compensating wage differentials and workers' marginal willingness to pay for safety (for example, Bartik [1987], Hwang, Reed and Hubbard [1992], Epple [1987], Gronberg and Reed [1994], Black and Knieser [2003], Ekland, Heckman and Nesheim [2004], Knieser, Viscusi, Woock and Ziliak [2005]). The major problem is related to what kinds of exclusion restrictions ensure identification. Bartik [1987] argued that both prices and quantities have to be considered endogenous when households face non-linear budget constraints. Both Bartik [1987] and Epple [1987] imply that exclusion restrictions from one side of the market cannot be justified. On the other hand, Ekland, Heckman and Nesheim [2004] show that the under-identification issue is related to an arbitrary linearisation that do not use all the information of the model.

Thirdly, I document the heterogeneity regarding worker preferences for fringe benefits. My study is thus related to Oyer [2007] and Abowd, Kramarz and Roux [2006]. Oyer does not analyse the relationship between benefits and turnover, and while Abowd, Kramarz and Roux document the daunting heterogeneity of the wage policies adopted by firms, they focus not on fringe benefits. While health insurance and pension schemes have been related to job-lock issues (see the literature referred above), I study a wider range of fringe benefits and the impact these benefits has on worker turnover.

Fourthly, I study how much workers gain economically from changing jobs, and how the composition of compensation changes as workers move between jobs. Few studies have addressed the issue of how job mobility cause compensation changes (see Parent [2002], and Postel-Vinay and Turon [2007] for recent contributions). Thus my work contributes to a thin literature.

Finally, I ask whether firms' compensation policies are reflected not only in their worker turnover patterns, but also in their productivity. This question has been asked before, but once again, the literature is thin. Many economists would accept that the way compensation is doled out would affect performance. Of the more recent contributions, Lazear [2000] finds that performance pay improves productivity, and Black and Lynch [2001] identify positive productivity impacts from new work practices and performance pay. On the other hand, Abowd, Kramarz and Roux [2006] find no correlation between the compensation policies of firms and their productivity. My productivity analysis actually provides a test of the HRM-model, which predicts that firms offering contracts providing relatively more benefits, contingent on workforce size, produce these amenities cheaper and are more productive than firms providing relatively less benefits.

What do I find? That wages are important instruments for managing the workforce is a well-known empirical fact. My study shows that fringe benefits should be treated as at least as important tools. Analysing workers' evaluation of fringe benefits within a dynamic perspective indicates strong worker preferences for these kinds of benefits. By providing more fringe benefits, employers strongly reduce worker turnover. Thus the single-most popular justification of employers in Norway why they provide fringe benefits is that these are important for recruitment and retention, i.e., worker turnover reasons, is clearly supported by data. Since workers appear to evaluate fringe benefits valued 1 Norwegian krone (Nok) higher than 1 Nok in money wages, this may reflect possible endowment and framing effects and biases of judgement. Furthermore, a less steep wage-tenure profile makes it easier for competing employers to poach even long-tenured workers. By changing jobs workers achieve higher money wages and fringe benefits values, but benefit values more so. As workers move up the job-ladder, benefits become increasingly more important part of compensation.

On the other hand, different groups of workers prefer different benefits-bundles, so employers should design their compensation bundle to target specific groups. Employer-provided child-care, for example, matters only for parents with small children. Stock-options strongly reduce the turnover of economists but not for other groups. This indicates that either economists work at better firms, or they are more able to see the true value of options.

Finally, my analyses on manufacturing joint-stock firms show that establishments providing relatively more fringe benefits as part of their worker remuneration are more productive than establishments providing relatively little fringe benefits.

The structure of the remaining paper is as follows. Section 2 briefly discusses why firms provide fringe benefits. Section 3 presents the theoretical background and derives expressions of workers' marginal willingness to pay (MWP) for fringe benefits. Section 4 presents the data. Section 5 provides descriptive statistics as an empirical introduction. The results of the individual-level job quit regressions and the derived estimates of workers' MWP for fringe benefits are presented in Section 6. Section 7 studies the workers' economic gain from mobility. The duration regressions of Section 8 then reveal the attractiveness of specific kinds of fringe benefits. Section 9 analyses the impact of fringe benefits policies on productivity, while Section 10 concludes.

2. Theoretical background

How does the literature usually explain why firms offer fringe benefits? One perspective is to focus on fringe benefits' monetary value. In many countries, fringe benefits should be reported to the tax authorities for tax purposes. Sometimes specific benefits are exempted tax, and this makes it more profitable for workers to receive and employers to provide fringe benefits instead of money wages (Ehrenberg [1971], Long and Scott [1982], Royalty [2000a]). Royalty [2000a] estimates a positive impact from tax preferences for employer-provided health insurance on probability that an employee will be eligible for health insurance at work. Fringe benefits are originally either bought by the employers or they are manufactured locally. In the former case, an employer may have the necessary market power to get a lower price than that an employee achieves on his own. In the latter case, this may save the employee the third-party mark-up.

Similarly, Oyer (2007) models three traits that affect the evaluation of fringe benefits. First, that scale economies or tax treatment cause firms to have a comparative advantage compared to workers. Second, workers with heterogeneous benefit preferences face search costs when matching to firms providing the benefits of their choice. Thirdly, certain benefits ease the burden of working long hours.

Certain fringe benefits can also be understood as a form of deferred compensation, and achieving efficiency gains by increased worker commitment, but also "locking" workers to firms. Pension schemes and stock-options are the proto-typical examples of these kinds of benefits. From such an incentive perspective, wages and fringe benefits may be considered quite similar, and benefits may thus act as a motivational device through the gift-exchange mechanism of Akerlof [1982]. As seen in the introduction, particularly pension schemes have been the focus of a number of studies.

Employers may by the provision of fringe benefits differentiate between workers (see Elliot [1991], Carrington, McCue and Pierce [2002]), i.e., they introduce an element of "discrimination". Employers may offer fringe benefits to particularly attractive workers or groups of workers, and offer them benefits which they desire.

Another perspective is to argue that fringe benefits share important traits with non-wage amenities. For the employees, fringe benefits are not readily used as payment for other goods. Fringe benefits are singled out from the basic wage, thus worker evaluation is influenced by endowment and framing effects (Thaler [1980], Tversky and Kahneman [1986], Kahneman, Knetsch and Thaler [1990]) and biases of judgement [Rabin 1998]. A holiday cottage provided by the employer may have a particular importance for some employees. And what are really the true costs of child care or a pension scheme? For many years such aspects have led the economic literature to treat fringe benefits as non-wage amenities [Elliot 1991]. The notions of deferred compensation, discrimination and incentive devices are equally relevant if fringe benefits are considered as non-wage amenities.

3.1. The Model

Since fringe benefits share important traits with non-wage amenities, Rosen's concept of hedonic prices [Rosen 1974] can also be applied to fringe benefits analysis. Profit maximising employers are matched to utility maximising workers sharing the same evaluation of the relationship between wages and fringe benefits. But an environment where workers change jobs is not explained by the classical hedonic wage framework.[4] Gronberg and Reed [1994], Hwang, Mortensen and Reed [1998] and Van Ommeren, van den Berg and Gorter [2000] explain this by introducing non-wage amenities into a search theoretic framework. In this environment the profit maximising firms offer job bundles of wage and non-wage amenities to achieve a desired labour supply, while the utility maximising workers quit whenever a job offer provides higher utility. This framework then provides the main theoretical motivation in this paper.

[4] Or as Gronberg and Reed [1994] and Hwang, Mortensen and Reed [1998] point out, the basic hedonic wage approach apply static optimising tools on a dynamic process; workers search continuously for better job offers.

The set-up of the model follows the equilibrium-search framework straight-forwardly, thus I just sketch the model. Workers' utility, denoted U(w,f), depends on wages and fringe benefits, , where w and f denotes wages and fringe benefits, respectively. Both wages and fringe benefits affect utility positively, i.e., $\partial U(w,f)/\partial w>0$, $\partial U(w,f)/\partial f>0$. Assuming convex costs of providing fringe benefits, C(f), and the existence of labour market frictions, firms' job offers or contracts comprise profit-maximising combinations of wages and fringe benefits, (w,f). Workers receive job offers randomly at a rate, λ, following a Poisson distribution, while current jobs are destroyed exogenously at a rate, δ, also following a Poisson distribution. The job offers are drawn randomly from an offer distribution, F(w,f). Each job offer provides a job bundle comprising a wage and an amount of fringe benefits. Workers quit whenever they receive job offers comprising job bundles providing higher utility. This implies that for a given level of wages, more benefits reduce the quit probability, while for a given level of fringes, higher wages reduce the quit probability. More formally, this may be described by a quit function, $q(U(w,f))= \delta+ \lambda(1-F(U(w,f))$, where $\partial q(U(w,f))/\partial U(w,f)< 0$. The higher utility a specific job bundle (i.e., combination of fringe benefits and wages) provides the less likely is a worker to quit.

Next, one needs to resolve the shape of the utility function. I assume that workers' utility function can be described as U(w,f)=u(w+bf), where I do not assume a parametric functional form for u(.), while the core of u(.) is assumed to be described by a linear combination of w and f. This is a rather flexible specification, which encompasses the linear utility function of Hwang et al.[1998] and CRRA-utility functions. In this set-up it is easy to derive the expression for workers' marginal willingness to pay (MWP) for fringe benefits:

1)
$$MWP = \frac{\frac{\partial U}{\partial f}}{\frac{\partial U}{\partial w}} = \frac{\frac{\partial q(U)}{\partial f}}{\frac{\partial q(U)}{\partial w}} = b.$$

This expression is equally valid for models outside the equilibrium search framework, since it only rests on general assumptions regarding the utility function and workers' quit behaviour. One should also note that, as pointed out by Van Ommeren et al. [2000], in the equilibrium search framework, Equation 1) is valid as long as the instantaneous utility function is linear and additive in w and f, and that the search environment is symmetric in w and f. If a high wage is more beneficial to search than a good value of f, then Equation 1) fails.

Readers may argue that the notion of fixed wages and non-wage components over workers' tenure is unrealistic, i.e., many groups of workers face compensation-tenure contracts. It is not uncommon to observe wages increasing with tenure. Hwang et al. [1998] and Van Ommeren et al. [2000] demonstrate the complexity of theoretically generalising the basic Burdett and Mortensen [1998] – equilibrium search model to incorporate hedonic wages. Thus formally establishing a hedonic wage-tenure contract model with search frictions and on-the-job search is outside the scope of this empirical paper. Conceptually one can extend the wage-tenure contract model of Burdett and Coles [2003] to incorporate hedonic wages. In Burdett and Coles [2003] a worker leaves a firm's employment at the rate $\delta + \lambda[1-F(V(s|w(.))]$, where s denote tenure and V expresses expected lifetime payoff (δ, λ, F and w as defined previously). Let now $\xi=(w,f)$ denote the job contract measured in utility units. A firm then offer a contract, $\xi(.)$, defined for all tenures $t \geq 0$, where the utility a worker receives is specified as a function of his or her tenure. Workers when receiving contract offers, then compare the expected lifetime utility provided by the offer and his or her current contract, i.e., the quit probability can be expressed as $\delta + \lambda[1-F(V(s|\xi(.))]$.

For Equation 1) this implies that the expression for workers' MWP for fringe benefits can be re-written:

2) $$MWP = \frac{\frac{\partial V}{\partial f}}{\frac{\partial V}{\partial w}} = \frac{\frac{\partial q(V)}{\partial f}}{\frac{\partial q(V)}{\partial w}} \stackrel{>}{\underset{<}{=}} \frac{\frac{\partial U}{\partial f}}{\frac{\partial U}{\partial w}} = b.$$

Workers' quit behaviour is determined by their lifetime utility. Only in the cases of a linear contract or a contract providing fixed wages and fringe benefits over time, lifetime MWP and instantaneous MWP are equal.

3. Empirical strategy for measuring workers' marginal willingness to pay for fringe benefits

The empirical strategy for measuring workers' MWP for fringe benefits has successfully been utilised by Gronberg and Reed [1994] and Van Ommeren et al. [2000]. The strategy is quite simply to run quit regressions of wages and fringe benefits, and then measure the MWP-value by Equation 1).[5] This section describes my main approach for estimating the quit function, while Section 8 describes a secondary approach (using richer data, but with less variation across time).

In this section, due to computer capacity reasons, I estimate quit regressions on a 5 percent random sample of all private sector Norwegian workers during the period 1995–2003 being between 20–60 years of age during the period of observation. This age interval is chosen to avoid quits related to retirement decisions. These regressions are primarily based on the linear probability model. Although this model ignores the discreteness of the dependent variable, and does not constrain the predicted probabilities to be between zero and one, OLS yields unbiased estimates. As a robustness check, I also estimate a conditional logit model.

As a reference, I assume that the probability that worker i employed by establishment f at time t quits can be expressed as:

3) $$q_{ift} = \lambda_1 W_{ift} + \lambda_2 F_{ift} + \beta X_{ift} + \Gamma_i + \varepsilon_{ift},$$

where q denotes an indicator variable taking the value 1(otherwise=0) if the worker quits, W, F and X denote wages, fringe benefits, a constant and other controls, respectively. Γ_i expresses an individual fixed term affecting the quit probability, while $\varepsilon_{ift}\sim N(0,\sigma)$ is an error term. In Equation 3), worker i's alternative compensation will be captured by $\beta X_{ift} + \Gamma_i$, where the X's expresses dummies for years and a dummy for being full-time worker. Equations 1) and 3) imply that MWP for fringe benefits in this case can be expressed as MWP=b=λ_2/λ_1.

[5] Gronberg and Reed [1994] estimated workers' MWP for job hazards using an accelerated failure-time (AFT) duration model based on a generalised gamma distributed error. If one accepts simplifications, all quit regressions can be used to provide MWP-figures. This depends on how close relationship one desires between the economic and econometric models. Van Ommeren et al. [2000] show for instance that Gronberg and Reed's strategy are not valid if workers' utility is represented by a non-linear utility function and the search intensity is endogenously determined. For a discussion between the relationship between duration models and economic theory, see van den Berg [2001]. Here he points out that "....the AFT model, the hazard does not serve as the focal point of model specification. This has strongly limited the use of these models in social science duration analyses [van den Berg, 2001, p. 3397].

Two potential problems may affect the estimates. The minor problem is that $\beta X_{ift} + \Gamma_i$ does not appropriately capture worker i's alternative compensation. A solution is to introduce a more involved X-vector. I know workers' educational qualifications on a detailed level (4-digit code, more than 600 codes). I define the expected alternative wage of a worker i belonging to educational group h employed by establishment f at time t (W^H_{ihft}) by the average wage of workers at time t belonging to the same educational group which are employed by other establishments. The alternative fringe benefits level (F^H_{ihft}) is defined similarly.

The main problem, however, is that W and F are to be considered endogenous variables. First, it is obvious that W and F are endogenous due to workers' utility maximising behaviour. Less obvious, but equally true as pointed out by Hwang et al. [1998], is that these regressions may be affected by bias caused by the establishments' profit maximising behaviour. An employer f determines simultaneously his profit maximising choices of the total compensation level C (which here follows from wages and fringe benefits) and the number of quits.

Another way of describing this problem is that the employer faces the maximization problem: $\max_{q_f, C_f} \Pi_f$, where q_f=h(C_f) and C_f=g(q_f). In equilibrium, all establishments earn equal profits, but some establishments will be small with a high worker turnover rate, while others will be big with a low worker turnover rate. To simplify, ignore for now that we are studying wages and fringe benefits, and just focus instead on the total compensation measure, C_{ift}. This implies that Equation 3) can be expressed:

4) $$q_{ift} = \lambda C_{ift} + \beta X_{ift} + \Gamma_i + \varepsilon_{ift}, \quad \varepsilon_{ift} = \Psi_f + \omega_{ift},$$

where Ψ_f expresses a fixed establishment term affecting the worker's quit probability following from how an employer considers compensation versus turnover, and ω_{ift} is an error term. Bias arises since $Cov(C_{ift}, \varepsilon_{ift}) \neq 0$.

One way to solve this problem is to introduce a set of instruments for wages and fringe benefits, and apply an IV-/2SLS-approach. In a non-experimental setting, it is however far from easy to find appropriate instruments, particularly since both supply and demand side variables are ruled out (as pointed out by Bartik [1987]). In my case, I will exploit the possibilities given by my LEED-data and use changes in the public tax policies. These changes are neither caused by workers nor employers, and may act as natural experiments.

The first instrument is the *pay-roll tax rate*. In Norway, this is geographically differentiated (5 zones, from zero to 14.1 percent in 2003), and during the period 1995 to 2003 not only does the tax rate change but several municipalities also changes zones. Due to commuting, this also affects the labour market of the neighbouring municipalities. Over time variation also occurs when workers and plants are relocated to different pay-roll tax zones. Since the tax is not paid for all fringe benefits, this clearly affects the provision of fringe benefits.

The second instrument is *changes in the marginal income tax rate from previous period to current period*, contingent on previous period's income level (see appendix for a formalised description). The marginal tax rate depends on four elements that changes over time: i) a basic sum that may be deducted from the earnings (K), ii) a basic tax rate affecting all (t), and iii) two tax rates which depend on the income level (tax rates t1 and t2, threshold levels L and M).[6]

The threshold levels for t1 and t2, L and M, as well as the tax rates and the deductible sum, K, vary across time, and they are geographically differentiated. For individuals, variation also occurs since over time workers and plants are relocated to different tax regions, municipalities may change tax regions, and income mobility changes the marginal tax rate. The kinks of the tax profile create discontinuities that may also be exploited for identification.

Since employers take workers mobility costs into account when determining their wage and benefits policies, changes in the marginal tax rate affect the provision of wages and benefits.

The main worker quit regression can then be expressed as:

[6] For example, in 2002 workers living in the capital earning more than 320 000 Nkr. (L) had to pay 13.5 percent top tax (t1) on earnings above 320 000 Nkr, while workers earning more than 830 000 Nkr. (M) had to pay an additional top tax (t2) of 19.5 on earnings above 830 000 Nkr. The basic deductible sum (K) was 43000, while the basic tax (t) was 35.8 percent.

5) $$q_{ift} = \beta_1 Year + \beta_2 fulltime_{ift} + \beta_3 W^H_{ihft} + \beta_4 F^H_{ihft} + \lambda_1 W_{ift} + \lambda_2 F_{ift} + \Psi_i + \varepsilon_{ift}.$$

The instruments ensure the identification of W and F in Equation 5). This model is estimated using GMM on first-differenced observations (Stata's XTIVREG2-procedure). The latter operation takes care of the fixed effect, as well as it provides consistent estimates even if one can assume that the instruments are only weakly exogenous (the classical "within-transformation can only be used if the instruments are actually strongly exogenous"(Cameron and Trivedi [2005:758]).

The linear probability model ignores the discreteness of the dependent variable, and does not constrain the predicted probabilities to be between zero and one. Thus as robustness check, I also estimate Equation 5) using the conditional logit model, using the same instruments for wages and fringe benefits in a first-step regression.

Finally, these regressions can be adapted so they bear empirical evidence on the models of Burdett and Coles [2003] and of Stevens [2004]. One of the predictions of Burdett and Coles is that a less steep wage profile for a firm makes it easier for competing firms to poach its long-tenured workers. This contrasts Stevens [2004], which predicts that poaching firms are able to attract low-tenured workers, but not those of high tenures.

An empirical measure of the steepness of an individual wage profile is of course the derivative of the individual wage profile function. Let $V(W)=w_0+w_1S+w_2S^2$, where S and W denote seniority and wages, respectively, express the wage profile. Then $V'(W)= w_1+w_2S$. A first-order linear approximation to V'(W) is, however, expressed by the wage growth from one period to the next. Thus let ΔW_{ift} express the wage growth of worker i employed by establishment f at time t.[7] Higher ΔW_{ift}, all other things equal, should anyway reduce worker turnover. In regressions contingent on tenure, ΔW_{ift} also acts as a relative measure of future expected wages.

How can one measure the starting wage offered by competing employers? W^H_{ihft}, as it is defined above, is measured by the average wage of workers at time t belonging to the same edu-

[7] If the wage-tenure contract is linear, then ΔW_{ift} measures the steepness correctly. A convex wage-tenure contract will be underestimated, while a concave wage-tenure contract (as is usually the case) will be overestimated.

cational group which are employed by other establishments. Similarly, it is possible to identify an alternative starting wage (SW^H_{ihft}) equalling the average wage of workers at time t belonging to the same educational group which are newly employed by other establishments (seniority less than 1 year). In a quit-regression incorporating both SW^H_{ihft} and W^H_{ihft}, the latter capture the impact of the seniority-profiles of competing firms. Higher SW^H_{ihft} should increase worker turnover.

To differentiate between Burdett and Coles [2003] and Stevens [2004] (albeit admittedly rather crudely) one then runs a quit-regression using ΔW_{ift}, SW^H_{ihft}, W^H_{ihft} , and the cross-terms ΔW_{ift}X SW^H_{ihft} , SW^H_{ihft} Xseniority^2 and ΔW_{ift}X SW^H_{ihft} Xseniority^2 (and the equivalent fringe benefits measures). Both theories predict that the sign associated with the former cross-term should be negative, i.e., increased back-loading of wages makes poaching more difficult. The sign associated with the last cross-term then differentiate between the two theories. If it is positive, then reduced back-loading of wages makes poaching of long-tenured workers easier.

This worker quit regression can then be expressed as:

6) $$q_{ift} = \beta_1 Year + \beta_2 fulltime_{ift} + \beta_3 W^H_{ihft} + \beta_4 F^H_{ihft} + \beta_5 SW^H_{ihft} + \beta_6 SF^H_{ihft} + \beta_7 SW^H_{ihft} Xseniority^2$$
$$+ \beta_8 SF^H_{ihft} Xseniority^2 + \beta_{10} \Delta W_{ift} + \beta_{11} \Delta F_{ift} + \beta_{12} SW^H_{ihft} X \Delta W_{ift} + \beta_{13} SF^H_{ihft} X \Delta F_{ift} +$$
$$+ \beta_{14} SW^H_{ihft} X \Delta W_{ift} Xseniority^2 + \beta_{15} SF^H_{ihft} X \Delta F_{ift} Xseniority^2 + \Psi_i + \varepsilon_{ift} ,$$

where the marginal impact of the starting wage on the quit probability is expressed by

7) $$\frac{\partial q_{ift}}{\partial SW^H_{ihft}} = \beta_5 + \beta_7 Xseniority^2 + \left[\beta_{12} + \beta_{14} seniority^2\right] \Delta W_{ift} .$$

If $\beta_{12} + \beta_{14} seniority^2$ <0 then reduced back-loading of wages will make poaching of also long-tenured workers easier. Equation 6) is estimated using similar instruments as Equation 5).

4. Data

The analyses are based on three data sets. The *first* data set comprises a questionnaire, ABU2003, answered early winter 2003 by the daily manager or personnel manager of roughly 2300

Norwegian establishments from both public and private sectors. These establishments are sampled from establishments with more than 10 employees. Furthermore, the sample is constructed so that large establishments are over-sampled (for example, all establishments with more than 300 employees are included in the sample). The ABU2003-establishments employ over 350 000 workers, i.e., nearly a fifth of the Norwegian workforce. The sampling procedure and the questionnaire are described in Holth [2003] and Torp [2005]. The questionnaire covers topics such as compensation, work practices and organisation issues. It is quite similar to questionnaires found in many countries, e.g., United Kingdom (work and employment relation surveys (WERS)) and United States (EQW-NES).

For my purpose, the questions regarding fringe benefits usage are particularly interesting. The questionnaire includes questions on whether employers provide to some or to all employees, fringe benefits such as private physician and extended own-declaration of sickness absence, cleaning assistance, children care, gym membership, extended holidays and holiday cottage. The questionnaire also gives information on whether the establishment provides training, stocks, stock options, and pension schemes to employees. Questions related to fringe benefits are not asked public administration employers.

The *second* data set, or more precisely, data system, is based on public administrative register data. It comprises *all* employers and their employees in Norway 1995–2004 (roughly 150000 employers and 1800000 employees each year) employed May 15th each year. This data set is a similar to an integrated register based data system, Current System for Social Data (CSSD), linked by Statistics Norway, comprising information from public administrative registers (except CSSD is not restricted to employment spells active on May 15th). This linked employer-employee data set provide information on workers (gender, educational qualifications), jobs (for example earnings, daily wage, hourly wage (only 2002-2004) the value of fringe benefits as they are reported to the tax authorities, weekly working hours (intervals, exact hours 2002-2004), seniority), firm- and establishment identifying numbers and on establishment-characteristics such as industry (5-

digit NACE), sector and municipality. It is possible to link information on the ABU2003-establishments' local labour market (municipality) and within detailed industry code (3-digit NACE) to the ABU2003-sample.

The job-specific fringe benefit measure is particularly important for my purposes. It consists of an amount given in Nkr. reflecting the tax authorities' evaluation of all reported taxable fringe benefits. Among the fringe benefits listed, one finds benefits of lower interest rate from employer provided loans, free or subsidised: telephone/mobile phone, newspaper, work clothing, public holidays, foods, child care, accident and retirement insurance, gains from buying stocks at lower prices than market value, stock options, housing, membership in private medical service and parking space. The list is thus quite comprehensive. It has changed during the years, as there seems to be a "catch-up race" going on between employers and the tax authorities. Employers introduce new non-reportable benefits, which the tax authorities later declare as reportable.

For research purposes, it is a nice feature of the Norwegian public administrative registers that each individual, each establishment and each firm are identified by unique identifying codes (separate number series). In my data, these original numbers are replaced by encrypted numbers. The encrypted number series for the establishments is also used in the questionnaire data set, making linking possible.

The quit- and duration-analyses in this paper are based on information from these two data sets, utilising different samples of the data. The quit-regressions rest on observations from a 5 percent random sample of all private Norwegian workers during the period 1995–2003 being between 20–60 years of age during the period of observation, others analyses rest on restricted samples. For example, the duration regressions and the evaluation of workers' MWP for the specific benefits will be based on the ABU2003-sample comprising 1419 private sector establishments (public administration excluded) and their 201285 workers, or for specific worker groups.

Unfortunately, for the productivity analyses we have to introduce a *third* data set: Statistics Norway's Capital-database (for documentation, see Raknerud, Rønningen and Skjerpen [2004]).

This database comprises information on key economic figures (e.g., capital, value added, measured in *running* prices) for all manufacturing joint-stock firms. The unique feature of this data set is that one is not limited to book-values, but key variables are measured in running prices. The unique firm-identifying number of the firms makes it possible to link information on wages and fringe benefits from the data system described above. This data set contains more than 50 000 observations during the period 1995 – 2002 on more than 10 000 firms.

5. Wages, fringe benefits, size and employer motivation for providing fringe benefits

Simple descriptive statistics presented in Table I based on the ABU-sample of establishments and workers 2003 on wages, fringe benefits, workforce sizes and employer motivation for providing fringe benefits act as an introduction to the Norwegian data and provide a background for the later empirical analyses. It presents a rough picture of the non-public administration sector establishments providing fringe benefits in Norway 2003.

[Table I around here]

Table I can be divided into four parts. The first part utilises the questionnaire information. On the left of Table I one sees the proportion of the establishment providing specific fringe benefits. While administrative register data have the benefits of providing information on the complete population, the purpose of the register determines what kind of information. This is not always what is desired by the researchers, and in my case I lack information about what kind of fringe benefits that employers provide. In the ABU2003 questionnaire the employers are asked about the provision of eight specific fringe benefits: pension schemes, allowed leave due to self-reported sickness in excess of collective agreements (from here on called extended sickness absence), private physician, gym membership, child care, cleaning assistance, holiday cottage (flat), vacation longer than collective agreements (from here on called extended vacation), stocks, stock options and training. It is possible for an employer to provide more than one fringe benefit.

Most establishments provide at least one fringe benefit (94 percent). Pension scheme and training are the most popular benefits (55 and 85 percent, respectively), while child care and cleaning assistance ranks as the least popular (2.8 and 0.7 percent, respectively).

The next section of Table I (four columns) presents the distributions of the hourly wage and the hourly value of fringe benefits reported to the tax authorities across the individual worker, and the number of provided fringe benefits measured from the questionnaire across establishments. The reported fringe benefits values are small compared to the wage levels, very unevenly distributed (skewed) and hugely censored (a zero value of fringe benefits is observed for the first quartile). The number of fringe benefits provided is more evenly distributed (but still skewed), with few employers providing zero fringe benefits.

The upper-right hand side of Table I (three columns) shows the relationship between compensation and workforce size. As one climbs in the size distribution, wages and fringe benefits values get larger. This has been observed for decades in the size-wage literature.[8]

The last section of Table I focus on what motivations the employers have for the provision of fringe benefits. The questionnaire presents four alternatives and asks the employers which he or she finds appropriate for motivation. The employer may select none, one or several alternatives. 29 percent of employers select none. Only 10 percent select more than 2 alternatives. Close to 50 percent of the employers' answer that fringe benefits are important for recruitment and retention. Roughly 20 percent of the employers reply, that employees prefer fringe benefits to wages or that fringe benefits are provided since the establishments can achieve lower prices than the employees. Very few employers reply that they provide fringe benefits to save pay-roll tax. This may reflect that the employers deem this answer for socially unacceptable.

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[8] Although not shown, the raw correlation is positive between wages and fringe benefits. High wages are associated with higher valued fringe benefits. I have also decomposed wages into fixed establishment effects (wage premiums) and fixed worker effects based on the method of Abowd, Kramarz and Creecy [2002], and studied the relationship between these and the provision of fringe benefits. The main impression is that fringe benefits are more extensively used among establishments higher in the wage premium distribution and with higher quality workforces.

Although not reported in the table, I found that motivation vary with establishment size. The larger the establishment, the more likely is the employer to motivate fringe benefits as important for recruitment and retention. A similar size-effect is found regarding the price motivation, which reflects that large establishments have stronger market-power than small.

6. The impact of compensation policies on workers' quit probabilities 1995-2003

In Section 3 I introduced a linear probability model of how workers' separation probabilities are affected by establishments' compensation policies. In this section I conduct regressions of this linear probability model as well as the conditional logit model on job level data. Table II presents the results from the basic quit regressions. Except for models 1 and 4, all models are estimated using GMM on first-differenced observations. Standard errors are robust and adjusted for possible auto-correlation. To avoid bias caused by possible endogeneity, I introduce instruments for establishments' wage and fringe benefits policies. Model 1 is estimated using OLS on first-differenced observations. Model 4 is estimated using conditional logit, while using the same set of instruments for establishments' wage and fringe benefits policies as used in Model 3. Model 5 equals Model 3, except that it analyses direct job-to-job separations.

Information on the strength and appropriateness of the instruments is reported in Table A.II. The instruments are in most models strong and perform very satisfactorily.

Based on the estimated parameters it is possible to derive an estimate of the marginal value to pay for fringe benefits. Using the estimated parameters' variance-covariance the delta-method yields the standard errors associated with the marginal value to pay for fringe benefits.

[Table II around here]

Model 1 reports the results from the OLS-regression. Since this regression is expected to yield biased estimates, it should come as no surprise that some of the estimates are wrong-signed. It indicates a positive impact of wage on turnover and implies negative MWP for fringe benefits.

Next, in Model 2, I introduce the instruments for establishments' wage and fringe benefits policies.[9] Both wages and fringe benefits values strongly reduce worker turnover, but fringe benefits more so. This is reflected in that the estimated marginal value to pay (MWP) for fringe benefits is larger than 1. On average during the period 1995-2003, workers' MWP for 1 Nkr. in fringe benefits is 6.69 Nkr.

Model 3 incorporate controls for the workers outside options (expressed by their alternative wages and alternative fringe benefits values). Better outside options should increase turnover, and Model 3 reveals that is indeed so. The turnover reducing impacts of wages and fringe benefits are, however, not qualitatively affected, reducing workers' MWP for fringe benefits only marginally compared to the results of Model 2.

Models 4-5 act primarily as robustness checks, and we see that these regressions only bring minor changes. Estimating the model using conditional logit, as in Model 4, yields only small changes. Focussing on direct job-to-job turnover as in Model 5 increases workers' MWP for fringe benefits to 8 Nok.

Table III presents the empirical evidence on the wage-tenure contract models. Except for Model 1, the quit regressions are estimated using GMM on first-differenced observations. The observed impact of wage growth and fringe benefits value growth can thus be interpreted contingent on seniority. The OLS-regression of Model 1 on first-differenced observations acts as a background case, since this model yields biased estimates. As in the main regressions of Table II, variables related to firms' compensation need to be instrumented. Table A.II in the appendix provides information on the strength and appropriateness of the instruments. Unfortunately, the instruments could be stronger, and the 2-step results may thus be biased towards the OLS-

[9] It is neither surprising nor obvious that the sign of the impact of wages on turnover changes from positive to negative. Evidence exists indicating that compensating wages is paid in Norway (see Dale-Olsen [2006b]). It is reasonable to assume that the injury hazard is positively correlated with both the quit hazard and wages. The injury hazard is not observed in my regressions, and thus the omitted variable bias causes an understating of the turnover-reducing impact of wages. On the other hand, it is not unusual to observe a positive correlation between wages and the work environment, i.e., high paid jobs and good working conditions go hand in hand, thus arguably overstating the turnover-reducing impact of wages.

results. Model 2 act as a reference case, and shows how the separation probability of workers is affected by wage growth and fringe benefits value growth.

[Table III around here]

Previously, Barth and Dale-Olsen [1999] show that increased back-loading of wages at the establishment-level decrease establishment's worker turnover. Similarly, Abowd, Kramarz and Roux [2006] observe that back-loading of wages are introduced where workers are more mobile, and argue that return to seniority should be viewed as "an incentive device that tries to counteract the potential adverse effects on capital accumulation of high inter-firm worker mobility" [Abowd, Kramarz and Roux 2006:F270].

Bearing in mind that the instruments in this case are weaker and the results thus not so strong, we see a quite similar story. Increased individual wage growth and/or increased individual fringe benefits value growth decrease the separation probability of workers, but fringe benefits value growth more so.

In Model 3 I introduce the controls relating competing firms' wage and fringe benefits values offers. These affect as expected the separation probability positively, but they leave the negative impact of current wages and fringe benefits basically unchanged.

The results of Model 4 show that the cross-term between alternative starting wage and wage growth is significantly negative, while the alternative starting wage affects turnover positively. This implies that stronger wage growth makes it more difficult to poach workers for competing employers. Both the models of Burdett and Coles [2003] and Stevens [2004] predict this.

The regression of Model 5 finally adds the cross-term between alternative starting wage, wage growth and seniority squared (and the similar cross-terms related to fringe benefits). This does not change the impact of variables previously included in the regressions, but we see that the sign of the parameter associated with the cross-term between alternative starting wage, wage growth and seniority squared is significantly negative. This implies that reduced wage growth makes it easier for competing employers to poach long-tenured workers. On average, the marginal impact of increasing competing firms' start wage by 100 Nok on the quit rate for 10 years-seniority workers is 4 percentage points. If one reduces the wage growth by 1 standard deviation, and then calculates the marginal impact of increasing competing firms' start wage by 100 Nok on the quit rate for 10 years-seniority workers, this increases to 5.6 percentage points. This result is thus supportive of Burdett and Coles [2003] and not Stevens [2004].

The conclusion to this section is obvious: both wages and fringe benefits are important instruments to achieve the desired labour supply, but fringe benefits more so. And on average workers are willing to pay on the margin several times as much in wages to get 1 Nok in fringe benefits. If the cost of providing these benefits is as low as the tax value, this should seem like a good deal for the establishments. Since the use of instruments not only correct for endogeneity bias but also measurement errors (for example, caused by the tax legislation), my interpretation is that it also indicates framing effects. Furthermore, this notion is strengthened considering that these reported fringe benefits values are taxed as ordinary wages.

7. The gain from job mobility

What do workers gain economically from job mobility? To address this issue I continue the analyses using the 5 percent random sample of workers used in the previous section. On this panel data set I then run several worker compensation IV-regressions based on the model:

$$8) \qquad C_{ift} = \beta_1 Year + \beta_2 fulltime_{ift} + \beta_3 newjob_{ift} + \Psi_i + \varepsilon_{ift},$$

where C denote compensation (either wages, fringe benefits or fringe benefits' proportion of total compensation) of worker i employed by establishment f at time t, Ψ_i expresses a fixed worker effect, while ε_{ift}~N(0,σ) is an error term. *Newjob* is an indicator variable taking the value of 1 if the worker has changed employer since previous period, 0 otherwise. Equation 8) is estimated using GMM on first-differenced observations (Stata's XTIVREG2-procedure).

Newjob is clearly an endogenous variable in this equation, and one needs an instrument to ensure identification. As instrument for *newjob* I use the proportion of all vacancies reported to the local employment offices that is also reported in media (for example newspapers)(from here on the variable is defined as vacancy-media). Vacancy-media is reported monthly for Norwegian municipalities, but the analysis rests on observations of yearly municipality-averages. During the period 1997 – 2001 the local employment offices followed a centrally determined policy that actively affected the number of vacancies not reported in the media (by boosting these numbers)(see Aetat[2004:5]). This affects the job probabilities (increased proportion of vacancies reported in media should reduce the new-job probabilities), but since it does reflect the general conditions in the labour market it should not affect compensation. Increased proportion of vacancies reported in media reduces the new-job probabilities. Information on the instrument and first-stage regressions is presented in Table A.III. The table shows that the instrument is strong, significant and correctly signed.

Table IV presents the results from the second-stage regressions. Models 1, 4 and 7 show the main results, while the remaining models add further information. Models 1, 4 and 7 show that by changing employer, workers' gain fringe benefits, workers' gain wages and they receive proportionally more fringe benefits as part of total compensation. If the job probability increases by 1 percentage point, fringe benefits values increase by 0.76Nok (Model 1). Similarly, if the job probability increases by 1 percentage point, wages increase by 1.20Nok (Model 4) and fringe benefits as part of total compensation increase by 2.3 percentage points (Model 7).

[Table IV around here]

Models 2, 5 and 8 repeat the previous analysis, but replace the newjob-dummy by a dummy taking the value 1 if the worker's employment relationship is not the same as the one that was first observed in the data. This measure will then capture the return to the first job-change, only. The results of models 2, 5, and 8 are quite similar to the results of models 1, 4, and 7.

Finally, in models 3, 6 and 9 we add the alternative wages and the alternative fringe benefits values as controls to capture education-specific compensation changes, but this does not change the results qualitatively.

8. Workers' MWP for specific fringe benefits

How do workers evaluate of specific fringe benefits in 2003? To answer this, I focus on the ABU-sample of 198228 workers who are employed May 15th 2003 by 1419 establishments (excluded public administration). During the next year, i.e., until May 15th 2004, 21 percent of the workers quit. Since we know when they departed and when they started, I can follow the strategy described in Section 3 and apply duration regressions to estimate the quit function's estimates, i.e., to provide me with the necessary estimates for the MWP-figures for *specific* fringe benefits and for *specific* groups of workers.

The basic assumption in duration models is that for each worker, the job duration can be expressed by the random variable T. Depending on the specific choice of model, one then derive a corresponding hazard function, h(t). Observed heterogeneity is incorporated by letting this hazard function depend on a vector, Z, of covariates, e.g. wages, fringe benefits, and other controls. The Cox Proportional Hazard model allows me to estimate the parameter vector, b, associated with Z without assuming a parametric distribution for the hazard function. The model only assumes that the hazard function is proportional to $e^{b'Z}$.[10]

In the literature on duration analysis it is not common to introduce IV-estimation, and I follow this literature. Neither is a fixed effect approach easily achieved (or maybe possible in my case, see Lancaster [2000] on the incidental parameter problem). In these regressions worker i's alternative compensation will be expressed by βX_{ift}, where the X-vector includes: education (years in excess of compulsory schooling), experience, dummies for field of education, for

[10] From a search theoretic point of view, regressions should be based on an exponential duration model. This model's distributional assumption is rather inflexible. The analysis has also been conducted on a wide range of parametric distributions, but since these only yields negligible differences, these results are not shown.

woman and for full-time worker, dummies for industry (2-digit NACE) and counties. The estimation is conducted straightforwardly using STATA's stcox-procedure (Cox PH) exploiting a combination of questionnaire and register data. Information of the specific fringe benefits is reported in the questionnaire on the establishment-level, thus the regressions take into account this clustering. Each observation is weighted to adjust for the stratified nature of the random sample. Table V present the results from these regressions.

In models 1-5 job spells not ended by May 15th, 2004, are treated as censored. In models 6-8 I estimate a competing risk model, where job spells not ended by May 15th, 2004, and job spells ending before May 15th, 2004, but not in a job, are treated as censored.

As controls for observable heterogeneity I include: education in years (in excess of compulsory schooling), 8 dummies for field of education, dummies for woman, dummies for full-time worker, dummies for industry (2-digit NACE), and dummies for counties. In additions to these controls, I include hourly wage, the hourly value of all fringe benefits as they are reported to the tax authorities, and dummies for different kinds of fringe benefits.

[Table V around here]

In models 1 and 2 I refrain from controlling for industry and county variation. Model 1 acts as a starting point for the analysis. It shows that higher wages reduce the quit hazard. In Model 2 I turn to the main issue in these regressions - the joint impact on the quit hazard of wages and fringe benefits. From Model 2 we see that higher hourly wage or higher hourly value of fringe benefits both reduce the quit hazard. Increasing wages or fringe benefits by 1 Nok reduces the hazard relative to the baseline by 0.4 and 0.8 percent, respectively.[11]

In Model 3 I add controls for industry and county variation. Still higher hourly wage and/or higher hourly value of fringe benefits both reduce the quit hazard, but particularly the impact from fringe benefits drops.

[11] If the amount of fringe benefits is dropped from the duration regression of Model 2, then the parameter associated with the hourly wage drops by less than 10 percent (from 0.0039 to 0.0036)(see Model 1 of Table V). This reflects that wages and fringe benefits are similarly correlated w.r.t. quits. If fringe benefits are not known and the friction parameters of the model are estimated using wages only, the measurement errors thus would be minor.

In Model 4 I turn to the impact on the hazard of wages and specific fringe benefits. Extended sickness absence leave, pension schemes and child care affects the quit hazard significantly. By providing extended sickness absence leave, pension scheme or child care the employer reduce worker turnover relative to the baseline by 14, 15 and 31 percent, respectively. The hazard-reducing impact of pension schemes is observed previously in the literature, but in a Norwegian context this impact is less obvious. Even in private sector firms, firms' pension contributions are invested in financial institutions independent of the firms, and workers keep their earned pension funds when changing employers. When I in Model 5 repeat the regression of Model 4, but include the hourly value of fringe benefits and several other controls as well, this mainly causes minor changes to the previous results. The exception is related to the impact of vacation and training on the hazard which turns significantly positive.

Finally, models 6-8 repeat the analysis of the previous regressions using a competing risk approach instead. Still higher hourly wage and/or higher hourly value of fringe benefits reduce the quit hazard. While the impact from wages drops, the impact from fringe benefits increases.

The interpretation of the estimates related to fringe benefits in Table V faces two potential problems. First, the information on the specific benefits that are provided by the employers is on the establishment level. Each worker employed by an employer providing a specific fringe benefit is treated as receiving this. In reality some of the benefits are such that it is highly unlikely that all employees receive these. Second, establishments may provide other benefits unknown to me as well, and the impact of these on the quit hazards are also captured by the included dummies for the specific benefits. The estimates of models 3, 5 and 6 are less affected by this criticism, since the value of fringe benefits reported to the tax authorities is reported on the job level. However, then I have no longer information on specific fringe benefits.

Using the parameter estimates of Model 2 and Model 4 of Table V, I then calculate workers' MWP for fringe benefits (standard errors following the delta method) and present the results in Table VI. On average, reported fringe benefits values, child care, pension scheme and extended sickness absence leave are associated with significant positive MWP-values.

[Table VI around here]

The MWP for 1 Nok benefit value reported to the tax authorities is around 2 Nok, which is clearly lower than the MWP-figures reported in Section 6. Calculating the MWP-figure using the competing risk model of job-to-job mobility, however, yields MWP-figures around 8 Nok, which is quite comparable to the figures of Section 6. The significant MWP-figures for the specific benefits are large. One interpretation is that workers have extremely strong preferences for these benefits. But it could also follow due to the problems discussed above.

It is reasonable to assume that the evaluation of these fringe benefits differs between different worker groups. Thus I have estimated similar duration regressions as Model 5 of Table V separately for five different worker groups: parents with small children (child<7 years of age), old childless workers (between 50 and 60 years of age), workers having completed compulsory schooling only, IT-educated workers and economists. The results are presented in Table VII.

[Table VII around here]

The table shows that a positive evaluation of child care is primarily caused by parents with small children. This impact is surprisingly strong given the wide availability of public child care in Norway.[12] Elderly workers prefer extended sickness absence leave. For workers having finished compulsory education only wages matter. Economists prefer fringe benefits and stock options, while their quit hazard is less sensitive to wages.

Finally, take a closer look on the results presented in Table V. One of the controls in models 5 and 8 is Municipality child care price per work hour. The impact of this variable on the quit hazard mirrors the impact of wages, but has the opposite sign and is much stronger. If public child care becomes 1 Nok more expensive, this increases the quit rate by more than what is achieved by cutting wages by 1 Nok. A positive impact on worker turnover from public child

[12] In Norway, the public paid parental leave covers 1 year. The country average of the child care coverage for 1-5 year old children is 72 percent, whereof around 55 percent is publicly provided.

care price is expected. At the margin, such price hikes makes some workers withdraw from the labour force to take care of their children and some workers seek employment at firms providing more flexible work. The negative impact on quits from child care provided by the employer is even 100 times stronger. The large discrepancy between how worker turnover is affected by market-provided (privately or publicly) child care and by employer-provided child care indicates possible framing and endowments effects.

9. The impact of fringe benefits policies on productivity

The final question in my study is if firms' compensation policies are reflected in their productivity. To answer this question I conduct several production function regressions. In the literature on the estimation of production functions there are two main approaches. Both approaches take into account the fact that the arguments in the production function are endogenous, thus reducing the attractiveness of simple OLS. The first successful approach follows the literature on dynamic panel estimation, and introduces orthogonality restrictions on the covariance matrix so that in first difference equations, lagged levels of the arguments are valid as instruments, while in level equations, lagged first-differences of the arguments are valid (the GMM-diff- and GMM-system-approaches (Arellano and Bond [1991], Blundell and Bond [1998], Bond [2002]).

The other approach advocates the use of independent instruments, for example in the form of a natural experiment. I follow this latter approach for two reasons. First, GMM-system and GMM-diff do not yield satisfactorily test results.[13] Secondly, in my case it is hard to justify from a theoretical point of view the necessary orthogonality restrictions. All though my instruments do not strictly speaking follow from an experiment, I argue they are weakly exogenous to the firm. I will return to the instrument vector later.

How should one embed the firm's fringe benefit policy into the production function? Griffiths [1999] shows how a simple Cobb-Douglas production function may be augmented to

[13] In previous versions of the paper GMM-system-estimation of production functions on a restricted sample of firms perform satisfactorily and yield qualitatively similar results to what is reported now in this paper.

take into account efficiency wage strategies of establishments. Thus it is quite natural to examine the productivity impact of fringe benefits policies by utilising an augmented but simple Cobb-Douglas production function, where I impose a constant elasticity of scale equal 1. It contains value added (Y), total yearly working hours (L), capital (K), and index measuring the value of fringe benefits relative to total wages ($e^{\theta F}$). F expresses the fringe benefits as share of total compensation. The index is 1 when no fringe benefit is offered. If firms providing fringe benefits instead of money wages are technologically more productive or they are able by their fringe benefits policy to motivate workers to put forward more effort than what is achieved by offering the same amount in money wages, then the estimated parameter θ will be positive. A natural null-hypothesis is then that θ equals zero.

The baseline production function for firm f at time t is expressed by Equation 9):

9) $$\ln \frac{Y_{ft}}{L_{ft}} = \beta_K \ln \frac{K_{ft}}{L_{ft}} + \theta F_{ft} + \gamma_t + \lambda_i + u_f + v_{ft},$$

where I also have included γ_t (a year-specific intercept) to reflect aggregate business cycle effects and λ_i (industry dummies, 2-digit level) to capture industry variation. u_{ft}, and v_{ft} reflect the error structure. v_{ft} is an establishment-specific productivity shock that may be serially correlated with the previous period. u_f expresses a fixed firm productivity effect.

Equation 9) will be estimated by OLS and GMM using first-differenced observations (Stata's XTIVREG2-procedure). GMM using first-differenced observations takes into account that high benefits firms may be permanently high-productive firms. We are actually studying how changes in fringe benefits levels affect changes in total factor productivity.

My instrument vector comprises firm-specific average of changes in workers' marginal tax rate (and squared), industry-specific average of log daily compensation (and squared) calculated using the information on competing firms (in the same 4-digit industry) only, industry-specific average of proportion of fringe benefits in total compensation (and squared) calculated using the information on competing firms (in the same 4-digit industry) only, the number of workers in the municipality employed by other firms with similar educational qualification, and cross-terms between these first-order terms. Except for changes in the marginal tax rate (which is clearly not determined by the firm), all the other instruments rest on information from competing firms, either in the same industry (4-digit) or in the same municipality. Information on the instruments' strength and tests are presented in Table A.IV. In some of the robustness-check-regressions, the instrument vector performs statistically not as strongly as desired.

Table VIII presents the results from the productivity analyses. Model 1 presents the OLS-results. The elasticity of capital is clearly significant, but no significant impact is observed from fringe benefits on productivity (the point estimate is even negative).

[Table VIII around here]

In Model 2 IV-estimation is conducted. Both the capital-ratio and the proportion of fringe benefits turn significant and strongly positive. Increasing the proportion of fringe benefits by 1 percentage point yields improved total factor productivity of 8.5 percent. Furthermore, as is seen from Table A.IV, the Cragg-Donald (N-L)*min EVAL/L2 F-stat of Stock and Yogo [2002] equals 4.65 which implies that a potential bias towards the OLS-figures is less than 30 percent. The potential bias is thus small and the direction of the bias implies that the regression underestimate the true impact of fringe benefits on productivity.

In Model 3 I add industry dummies. The inclusion of the industry dummies does not change the results in any qualitatively way. Increasing the proportion of fringe benefits by 1 percentage point yields improved total factor productivity of 8.1 percent.

Models 4 – 6 act as robustness checks. Although my first-difference approach takes into account the first-order selection effect (that high productivity firms may provide larger quantities of benefits), is it still possible that my results follow from the selection and recruitment of more productive worker to high benefits-firms. To address this issue closer I study firm's hiring behaviour. Model 4 repeats the analysis of Model 3, but adds the firm-specific hiring rate as an additional control. This is obviously endogenous, and has to be instrumented along with the other variables. Model 5 focuses on a sub-sample of the firms that do not change their workforce. Since the workforce is constant, there is even less room for selection issues. These models reveal that the proportion of fringe benefits strongly affect productivity. Ideally the estimated effect should statistically been stronger, but the point estimates are on the level of models 2 and 3. This adds strength to the notion that the observed fringe benefit-effect is a causal effect and not a worker selection effect.

The final regression of Model 6 adds the relative compensation premium of the firm as a final control, thus capturing firms' efficiency wage strategies. The estimate associated with benefits drops markedly and is no longer significant, but the point estimate is still sizeable and positive. Neither the validity nor the interpretation of this result is clear, since the instrument vector in this regression does not perform very well. The need to instrument four endogenous variables is demanding, and one looses the average industry wage as an instrument as well.

The conclusion to this section is that firms offering contracts providing relatively more benefits are more productive than firms providing relatively less benefits. This prediction follows from the HMR-model if firms turn heterogeneous w.r.t. the cost of producing the non-wage amenities.[14] My empirical analysis is unfortunately not able to differentiate between whether this is a reflection of technological changes (as in the HMR-model) or if it is workers that become more motivated and thus provide more effort.

10. Conclusion

This paper has tested three notions regarding the provision of fringe benefits: i) workers care about these kinds of benefits, ii) firms provide such benefits primarily due to retention and

[14] By fixing the workforce size in the estimation of the production function, the value of the contract to workers is fixed. Thus to observe, contingent on workforce size, that one firm provides compensation comprising a higher proportion benefits than another firm, has to imply that we compare firms having different costs in producing the non-wage job amenity. The firm providing the highest proportion of benefits has to be able to produce (or procure) these benefits cheaper than the other firm.

recruitment, and iii) the provision of these benefits affects or reflects firm productivity. I have addressed these issues using a wide range of statistical methods on different populations and different periods of observations. As expected, the results divert somewhat, but not much.

My results must be interpreted as strongly supportive of the practice of providing fringe benefits to workers, particularly if an employer desires to reduce worker turnover. Most employers provide fringe benefits for retention and recruitment purposes, so in this case my results are aligned with employers' motivation and beliefs.

Fringe benefits as they are reported to the tax authorities strongly reduce worker turnover. Workers evaluate fringe benefits higher than the equivalence in money wages, at least if one believes the fringe benefits values reported to the tax authorities. And this is not caused by different taxation, since these fringe benefits values are taxed as ordinary income. Unfortunately, I have no information on the true costs to the establishment in providing all these benefits. Thus I can not answer whether workers generally truly miscalculates the true value of all these benefits.

From questionnaire data I am able to draw inference on specific fringe benefits, and this analysis reveals mixed picture. Of the specific fringe benefits provided in 2003, it appears that workers particularly appreciate extended sickness absence leave, pension scheme and child care. The latter result is, not surprisingly, caused by parental workers. For other groups of workers, other benefits appear more appreciated. The important implication is thus that different groups of workers prefer different benefits-bundles, so employers should take care when designing their compensation bundle to target specific groups.

Although my focus on fringe benefits has primarily been as a worker turnover reducing device, I have shown that fringe benefit policies and productivity are closely related – at least for manufacturing joint-stock firms. Firms providing higher valued fringe benefits relative to the total compensation have higher productivity than firms providing little benefits. Potentially this is a strong and important result, since workforce selection is unlikely to be the reason for my observations. Firstly, this may be interpreted as lending support to the HMR-model, i.e., high benefits firms are also technologically more productive. Secondly, it supports the notion that fringe benefits increase motivation and thus productivity in efficiency terms.

Finally, my study also provides evidence on compensation-tenure contracts. Both wages and fringe benefits are important parts of contracts ensuring that the desired labour supply is achieved, but fringe benefits more so. Particularly, reduced back-loading of wages provide firms with greater incentives to raise their starting wages and thus poach even long-tenured workers using on-the-job search. My results are thus strongly supportive of Burdett and Coles [2003].

Three problems weaken my conclusions. First, the wage-tenure contract model of Burdett and Coles [2003] should theoretically be extended to incorporate hedonic wages, and then be addressed empirically (for example by structural estimation). Secondly, it remains to be seen if the productivity impact holds up for the non-manufacturing sectors. Thirdly, the benefit policy is determined jointly with other wage and organizational issues. Establishments introducing benefits as an important part of workers' compensation may also have introduced new work practices (NWP) and other incentive wage systems, and this may improve productivity [Black and Lynch 2001]. Future research should take care to treat these issues simultaneously, thus being able to disentangle the separate impacts on productivity from work practices and compensation policies.

APPENDIX

On the marginal tax rate

The marginal tax rate depends on four elements that changes over time: i) a basic sum that may be deducted from the earnings (K), ii) a basic tax rate affecting all (t), and iii) two tax rates which depend on the income level (tax rates t1 and t2, threshold levels L and M). The changes in the marginal tax rate can be expressed formalised as:

$$dtax_{ikt} = \begin{cases} 0.9t_{kt}I_{ikt-1} - 0.9t_{kt-1}I_{ikt-1} & \text{if } 0.1I_{ikt-1} \leq K_{kt-1}, \\ t_{kt}(I_{ikt-1}-K_{kt})/I_{ikt-1} - t_{kt-1}(I_{ikt-1}-K_{kt-1})/I_{ikt-1} & \text{if } 0.1I_{ikt-1} > K_{kt-1} \,\&\, I_{ikt-1} < L_{kt-1}, \\ t1_{kt} + t_{kt}(I_{ikt-1}-K_{kt})/I_{ikt-1} - t1_{kt-1} - t_{kt-1}(I_{ikt-1}-K_{kt-1})/I_{ikt-1} & \text{if } 0.1I_{ikt-1} > K_{kt-1} \,\&\, I_{ikt-1} < M_{kt-1}, \\ t2_{kt} + t1_{kt} + t_{kt}(I_{ikt-1}-K_{kt})/I_{ikt-1} - t2_{kt-1} - t1_{kt-1} - t_{kt-1}(I_{ikt-1}-K_{kt-1})/I_{ikt-1} & \text{if } 0.1I_{ikt-1} > K_{kt-1} \,\&\, I_{ikt-1} < M_{kt-1}, \end{cases}$$

where I_{ikt} defines yearly earnings for worker i living in municipality k at time t.

Tables

[Table A.I around here]

[Table A.II around here]

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TABLE I

Descriptive statistics on compensation. 2003

Proportion (in %) of establishments providing:	
At least one fringe benefit	94.2
Pension scheme	55.1
Extended sickness absence	26.6
Private physician	15.4
Gym	33.4
Child care	2.8
Cleaning assistance	0.7
Holiday home	15.1
Extended vacation	21.5
Stocks	10.9
Stock options	4.0
Training	84.6

Quantile	Hourly wage	Hourly fringe benefits	Number of fringe benefits
Min	0.1	0	0
1	8.6	0	0
5	42.3	0	1
10	75.7	0	1
25	124.5	0	2
50	157.4	1.0	3
75	205.8	2.9	5
90	278.2	6.6	6
95	341.3	21.3	6
99	524.9	56.7	8
Max	5880.0	681.1	10
Mean	173.9	3.9	2.7

Workforce size	Hourly wage	Hourly fringe benefits
11 - 25	155.2	2.9
26 - 50	163.5	3.1
50 - 99	170.7	4.1
100 - 250	183.6	4.6
>250	201.6	5.5

The provision of fringe benefits and employer motivation (%)	
Employees prefer FB to wages	21.1
Recruit/retain workers	46.8
Lower price than workers	19.4
Saves pay-roll tax	1.7
None of the above	29.1

Note: Hourly wage and hourly fringe benefits are calculated using job level information (201285 observations) for year 2003 on employment spell, expected number of weekly working hours, and annual earnings and annual fringe benefits values reported to the tax authorities. Questionnaire information is also linked to register information for 2003. Information on specific fringe benefits and the number of fringe benefits are based on 1419 establishment-level observations. These are weighted to be representative for the population of private sector establishments employing at least 11 employees.

TABLE II

The impact of compensation on worker's separation probabilities 1995-2003. Private sectors.

Dependent variable	q_{ift}	q_{ift}	q_{ift}	q_{ift}	qj_{ift}
Model	1	2	3	4	5
W_{ift}	0.0001^{x}	-0.0017^{x}	-0.0018^{x}	-0.0041^{x}	-0.0023^{x}
	(0.3 e^{-5})	(0.0024)	(0.0004)	(0.0007)	(0.0004)
FB_{ift}	$-0.2e^{-4z}$	-0.0116^{x}	-0.0113^{x}	-0.0276^{x}	-0.0131^{x}
	($0.12e^{-4}$)	(0.0024)	(0.0024)	(0.0037)	(0.0019)
Alternative W_{ift}			0.0010^{x}	0.0020^{x}	0.0014^{x}
			(0.0002)	(0.0005)	(0.0003)
Alternative FB_{ift}			0.0019^{z}	0.0098^{x}	0.0024^{x}
			(0.0010)	(0.0011)	(0.0011)
Fixed worker effects	Yes	Yes	Yes	Yes	Yes
Dummies year, fulltime	Yes	Yes	Yes	Yes	Yes
Estimation method	OLS-FD	GMM-FD		C-Logit	GMM-FD
IV	No	Yes	Yes	Yes	Yes
N(workers)	186123	1861233	186123	186123	186123
NxFxT(observations)	938314	938314	938314	938314	938314
Implied marginal willingness to pay in wages for increasing fringe benefits by 1 Nkr. (as valued by the tax authorities)					
	-0.2851^{z}	6.6949^{x}	6.2305^{x}	6.7018^{x}	8.0190^{x}
	(0.1528)	(1.4510)	(1.4092)	(0.6737)	(1.9779)

Note: Population: 5 percent random sample of workers aged 20-60 years during the period 1995-2003. Estimation method: Except for models 1 and 4, all models are estimated using GMM on first-differenced observations. Model 1 is estimated using OLS on first-differenced observations. Model 4 is estimated using conditional logit. Dependent variables: q_{ift} denotes an indicator variable taking the value of 1 if worker i employed by establishment f separates from the establishment at time t, otherwise it is zero; qj_{ift} denotes an indicator variable taking the value of 1 if worker i employed by establishment f separates from the establishment at time t and is employed by time t+1, otherwise it is zero. W_{ift} denotes daily wage of worker i employed by establishment f at time t. FB_{ift} denotes daily value fringe benefits of worker i employed by establishment f at time t. Alternative wage and alternative fringe benefits: controls for average wage and average fringe benefits values for workers with similar educational qualification employed by other establishments. IV-set: Worker i's daily wage and daily fringe benefits values while employed by establishment f are instrumented by pay-roll tax rate and changes in the marginal tax rate. See Table A.II in the appendix for further details. Robust standard errors adjusted for autocorrelation presented in parentheses. Standard errors for the estimated marginal willingness to pay for fringe benefits are calculated using the delta method. ^{x}, ^{y}, and ^{z} denote 1, 5, and 10 percent level of significance, respectively.

TABLE III

The impact of compensation growth on worker's separation probabilities 1995-2003. Private sectors.

Dependent variable	q_{ift}	q_{ift}	q_{ift}	q_{ift}	q_{ift}
Model	1	1	2	3	4
Δ W_{ift}	$1.6e^{-5x}$	-0.0064^{x}	-0.0064^{x}	-0.0044^{x}	-0.0033^{x}
	$(1.3e^{-6})$	(0.0021)	(0.0021)	(0.0006)	(0.0006)
Δ FB_{ift}	$-1.3e^{-5x}$	-0.0133^{y}	-0.0133^{y}	-0.0109^{x}	-0.0095^{x}
	$(0.7e^{-6})$	(0.0052)	(0.0052)	(0.0011)	(0.0011)
Alternative W_{ift}			0.0007^{x}	0.0006^{x}	0.0041^{x}
			(0.0003)	(0.0001)	(0.0001)
Alternative FB_{ift}			0.0003	-0.0002	0.0003
			(0.0020)	(0.0003)	(0.0003)
Alternative start W_{ift}			0.0002^{x}	0.0003^{x}	$3.6e^{-6}$
			(0.0001)	(0.0001)	$(2.9e^{-6})$
Alternative start FB_{ift}			0.0042	0.0033^{x}	0.0031^{x}
			(0.0010)	(0.0011)	(0.0005)
Δ W_{ift}XAlternative start W_{ift}				$-1.3e^{-6x}$	$-6.5e^{-7x}$
				$(1.3e^{-7})$	$(1.5e^{-7})$
Δ FB_{ift} XAlternative start FB_{ift}				$4.8e^{-6}$	$1.7e^{-5}$
				$(1.3e^{-5})$	$(1.5e^{-5})$
Alternative start W_{ift} X$seniority_{ift}^2$					$7.6e^{-6x}$
					$(1.9e^{-7})$
Alternative start FB_{ift} X $seniority_{ift}^2$					$-5.4e^{-6z}$
					$(3.2e^{-6})$
Δ W_{ift}XAlternative start W_{ift} X$seniority_{ift}^2$					$-2.0e^{-8x}$
					$(1.2e^{-9})$
Δ FB_{ift}XAlternative start FB_{ift} X $seniority_{ift}^2$					$-4.0e^{-7x}$
					$(1.4e^{-7})$
Fixed worker effects	Yes	Yes	Yes	Yes	Yes
Dummies year, fulltime	Yes	Yes	Yes	Yes	Yes
Estimation method	OLS-FD		GMM-FD		
IV	No	Yes	Yes	Yes	Yes
N(workers)	176395	176395	176395	176395	176395
NxFxT(observations)	743809	743809	743809	743809	743809

Note: Population: 5 percent random sample of workers aged 20-60 years during the period 1995-2003. Estimation method: Except for Model 1, all models are estimated using GMM on first-differenced observations. Model 1 is estimated using OLS. Dependent variables: q_{ift} denotes an indicator variable taking the value of 1 if worker i employed by establishment f separates from the establishment at time t, otherwise it is zero. ΔW_{ift} denotes daily wage growth of worker i employed by establishment f from period t-1 to period t. ΔFB_{ift} denotes daily value fringe benefits growth of worker i employed by establishment f from period t-1 to period t. Alternative wage and alternative fringe benefits: controls for average wage and average fringe benefits values for workers with similar educational qualification employed by other establishments. Alternative starting wage and starting fringe benefits value are calculated for workers with similar educational qualification just starting their employment relationship at other establishments. IV-set: Worker i's daily wage and daily fringe benefits values while employed by establishment f are instrumented by pay-roll tax rate and changes in the marginal tax rate. See Table A.II in the appendix for further details. Robust standard errors adjusted for autocorrelation presented in parentheses. ^{x}, ^{y}, and ^{z} denote 1, 5, and 10 percent level of significance, respectively.

TABLE IV
Economic gain from mobility.

Dependent variable	FB_{ift}	FB_{ift}	FB_{ift}	W_{ift}	W_{ift}	W_{ift}	$(FB/W)_{ift}$	$(FB/W)_{ift}$	$(FB/W)_{ift}$
Model	1	2	3	4	5	6	7	8	9
New job since previous period$_{ift}$	76.505^{x}			734.230^{x}			0.023^{z}		
	(26.005)			(199.963)			(0.012)		
New job since first observation$_{ift}$		120.768^{x}	110.492^{x}		1159.027^{x}	1074.031^{x}		0.037^{y}	0.033^{z}
		(39.182)	(37.726)		(289.356)	(273.654)		(0.019)	(0.019)
Alternative W_{ift}			-0.004^{x}			0.642^{x}			-4.4e^{-6x}
			(0.002)			(0.014)			(1.0e^{-6})
Alternative FB_{ift}			0.428^{x}			-1.461^{x}			2.0e^{-4x}
			(0.061)			(0.206)			(1.0e^{-5})
Fixed worker effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dummies year, fulltime	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estimation method					GMM-FD				
IV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N(workers)	186061	186061	186061	186061	186061	186061	186061	186061	186061
NxFxT(observations)	940170	940170	940170	940170	940170	940170	940170	940170	940170

Note: Population: 5 percent random sample of workers aged 20-60 years during the period 1995-2003. The variable New job since previous period expresses an indicator variable taking the value of 1 if worker i employed by establishment f at time t was employed by a different employer at time t-1, otherwise it take the value of 0. The variable New job since first observation expresses an indicator variable taking the value of 1 if worker i employed by establishment f at time t has been employed by (a) different employer(s) earlier in the observation period, otherwise it take the value of 0. Estimation method: All models are estimated using GMM on first-differenced observations. Dependent variables: W_{ift} denotes daily wage of worker i employed by establishment f at time t; FB_{ift} denotes daily value fringe benefits of worker i employed by establishment f at time t; $(FB/W)_{ift}$ denotes daily value fringe benefits relative to wages of worker i employed by establishment f at time t. Alternative wage and alternative fringe benefits: controls for average wage and average fringe benefits values for workers with similar educational qualification employed by other establishments. IV-set: The new job indicator variables of worker i are instrumented by the proportion of vacant positions in the municipality m at time t reported to the labour offices that are advertised in media. See Table A.III in the appendix for further details. Robust standard errors adjusted for autocorrelation presented in parentheses. ^{x}, ^{y}, and ^{z} denote 1, 5, and 10 percent level of significance, respectively.

TABLE V

Wages, fringe benefits and job durations. Private sectors.

	All separations					Job-to-job (competing risk)		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Hourly wage	-0.0039^{x}	-0.0036^{x}	-0.0033^{x}	-0.0033^{x}	-0.0031^{x}	-0.0013^{x}	-0.0009^{x}	-0.0010^{x}
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0005)	(0.0004)	(0.0003)
Hourly value of fringe benefits		-0.0076^{x}	-0.0046^{y}		-0.0033	-0.0111^{y}	-0.0054^{z}	-0.0039
		(0.0030)	(0.0030)		(0.0022)	(0.0046)	(0.0032)	(0.0031)
Pension scheme				-0.1623^{y}	-0.1262^{y}			-0.1759^{z}
				(0.0671)	(0.0640)			(0.1015)
Extended sickness absence leave				-0.1308^{y}	-0.1404^{y}			-0.2090^{y}
				(0.0588)	(0.0558)			(0.1051)
Private physician				-0.0790	-0.0500			-0.0741
				(0.0678)	(0.0669)			(0.1253)
Gym membership				0.0088	0.0046			0.0701
				(0.0549)	(0.0579)			(0.1132)
Child care				-0.3649^{y}	-0.3269^{y}			-0.5288^{y}
				(0.1617)	(0.1586)			(0.2351)
Cleaning assistance				0.2016	0.2088			0.8545^{x}
				(0.2287)	(0.2218)			(0.3107)
Holiday cottage/flat				-0.0591	-0.0156			-0.0651
				(0.0646)	(0.0668)			(0.1380)
Extended vacation				0.0820	0.1258^{z}			0.1530
				(0.0642)	(0.0672)			(0.1163)
Stocks				0.1086	0.1132			0.2106
				(0.0769)	(0.0746)			(0.1336)
Stock options				-0.1068	-0.0871			-0.2770
				(0.1221)	(0.1181)			(0.1896)
Training				0.1020	0.1792^{y}			0.2406
				(0.0944)	(0.0854)			(0.1530)
Saves pay-roll tax					-0.0142			-0.0832
					(0.2375)			(0.3269)
Achieve lower prices					0.1357			0.1162
					(0.0679)			(0.1245)
Employees prefer FB to wages					-0.0067			0.0130
					(0.0799)			(0.1356)
Recruit and retain					-0.1325			-0.0639
					(0.0635)			(0.1250)
Alternative wage					-0.0045^{x}			-0.0032^{x}
					(0.0009)			(0.0009)
Alternative fringe benefits value					0.0341^{x}			0.0240
					(0.0097)			(0.0168)
Performance pay					-0.1170			-0.2606^{y}
					(0.0624)			(0.1061)
Individual wage determination					0.0636			0.1972^{z}
					(0.0620)			(0.1034)
Fulltime worker					-0.5761			-0.1241^{z}
					(0.0457)			(0.0716)
Municipality child care coverage					0.0017			0.0034
					(0.0039)			(0.0070)
Municipality child care price per work hour					0.0055^{x}			0.0044^{x}
					(0.0006)			(0.0011)
Woman, education(years), fields of education, occupation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County, industry (2-digit)			Yes	Yes	Yes		Yes	Yes

Note: Duration model: COX PH. Observations of 198228 workers employed by 1360 private sector establishments on May 15, 2003, which then are followed until May 15, 2004. Regressions are weighted to be representative for the population of establishments employing at least 11 workers. Hourly value of fringe benefits is calculated from the total annual value of benefits reported to the tax authorities. The different fringe benefits are reported as establishment-level variables, thus each establishment is treated as a cluster. Clustering-adjusted robust standard errors in parentheses. ^{x}, ^{y} and ^{z} denote 1, 5, and 10 percent level of significance, respectively.

TABLE VI

Marginal willingness to pay for fringe benefits. Private sectors. In hourly wages (Nkr.)

	1 Nkr. value of fringe benefits	Extended sickness absence leave	Private physician	Gym membership	Child care	Cleaning assistance	Holiday cottage	Extended vacation	Pension scheme	Stocks	Stock options	Training
All separations	2.1^{y}	39.2^{y}	23.7	-2.7	109.3^{y}	-60.4	17.7	-24.6	48.6^{y}	-32.5	32.0	-30.5

Note: Figures for all separations calculated from the estimates presented in Table IV, models 2 and 4. Mean and standard deviation (in parentheses) of hourly wage across private sectors are 200.4 (115.3). Standard errors (not shown) for the estimated marginal willingness to pay for fringe benefits figures are calculated using the delta method. ^{x}, ^{y}, and ^{z} denote 1, 5, and 10 percent level of significance, respectively.

TABLE VII

Wages, fringe benefits and job durations. Different groups of private sector workers

	All separations				
	Parents with young children	Elderly, 50-60 years of age	Compulsory schooling only	IT	Economists
Hourly wage	-0.0027[x]	-0.0013[x]	-0.0046[x]	-0.0039[x]	-0.0008
	(0.0005)	(0.0004)	(0.0007)	(0.0013)	(0.0007)
Hourly value of fringe benefits	0.0011	-0.0014	-0.0042	-0.0203	-0.0107[x]
	(0.0026)	(0.0034)	(0.0083)	(0.0130)	(0.0040)
Pension scheme	-0.0841	-0.2032[z]	-0.0046	-0.2651	-0.4153[z]
	(0.0798)	(0.1071)	(0.1075)	(0.3782)	(0.2431)
Extended sickness absence leave	-0.0822	-0.2226[y]	-0.0792	-0.5729[y]	-0.3251[y]
	(0.0705)	(0.0915)	(0.0960)	(0.2466)	(0.1621)
Private physician	-0.0142	-0.0828	-0.0728	-0.4739	0.0144
	(0.0898)	(0.0956)	(0.1050)	(0.4302)	(0.1585)
Gym membership	-0.0193	-0.0156	0.0418	0.5132[y]	0.0351
	(0.0704)	(0.0800)	(0.0848)	(0.2265)	(0.1493)
Child care	-0.5009[y]	-0.1645	0.0800	-0.3058	-0.4411
	(0.1844)	(0.1738)	(0.3077)	(0.2610)	(0.3433)
Cleaning assistance	0.0113	0.4201	0.1374	0.6074[z]	0.2393
	(0.2294)	(0.3162)	(0.2242)	(0.3332)	(0.3415)
Holiday cottage/flat	0.0130	0.0046	-0.0727	-0.4380[y]	-0.1009
	(0.0744)	(0.0924)	(0.0983)	(0.2074)	(0.1763)
Extended vacation	0.0279	-0.1235	0.1303	-0.0782	-0.0686
	(0.0809)	(0.1046)	(0.1065)	(0.2370)	(0.1650)
Stocks	0.1511	0.1086	0.0555	0.4682[y]	0.2367
	(0.0957)	(0.0769)	(0.1247)	(0.2266)	(0.1607)
Stock options	-0.0831	0.0860	0.1275	-0.1517	-0.3736[z]
	(0.1292)	(0.1631)	(0.1672)	(0.3003)	(0.2301)
Training	-0.0404	0.3198[y]	0.1333	0.0785	-0.1032
	(0.1157)	(0.1431)	(0.1442)	(0.4982)	(0.3407)
Woman	Yes	Yes	Yes	Yes	Yes
Years of education	Yes	Yes		Yes	Yes
Fields of education	Yes	Yes			
Occupation	Yes	Yes	Yes		
County, industry (2-digit)	Yes	Yes	Yes	Yes	Yes
N	43104	36048	21069	2773	6535

Note: Duration model: COX PH. Column headings denote different kinds of mobility and different groups of workers. Parents denote workers being parents to children less than 7 years of age (compulsory schooling starts at 7 years of age). Elderly denotes workers between 50 and 60 years of age. Comp. school denotes workers having finished compulsory schooling only. IT denotes college and university IT-educated workers. Econ denotes college and university educated economists. Workers employed by 1360 private sector establishments on May 15, 2003, which then are followed until May 15, 2004. Regressions are weighted to be representative for the population of establishments employing at least 11 workers. Hourly value of fringe benefits is calculated from the total annual value of benefits reported to the tax authorities. The different fringe benefits are reported as establishment-level variables, thus each establishment is treated as a cluster. Clustering-adjusted robust standard errors in parentheses. [x], [y], and [z] denote 1, 5, and 10 percent level of significance, respectively.

TABLE VIII

The impact of compensation policy on manufacturing firms' productivity 1995-2003.

Dependent variable	$Log(V/T)_{ft}$	$Log(V/T)_{ft}$	$Log(V/T)_{ft}$	$Log(V/T)_{ft}$	$Log(V/T)_{ft}$	$Log(V/T)_{ft}$
Model	1	2	3	4	5	6
$Log(C/T)_{ft}$	0.229^{x}	0.527^{x}	0.528^{x}	0.523^{x}	0.266^{z}	0.592^{x}
	(0.145)	(0.093)	(0.093)	(0.092)	(0.092)	(0.099)
$(FB/(FB+W))_{ft}$	-0.135	8.531^{y}	8.163^{y}	8.935^{z}	6.913^{z}	3.367
	(0.194)	(4.211)	(4.187)	(5.211)	(5.211)	(5.977)
Hr_{ft}				0.042		-0.170
				(0.239)		(0.249)
$Log((FB+W)_{ft}/(FB+W)_{Nt})$						0.020^{y}
						(0.009)
Industry (2-digit)			Yes	Yes		Yes
No workforce change					Yes	
Fixed firm effects	Yes	Yes	Yes	Yes	Yes	Yes
Dummies year, fulltime	Yes	Yes	Yes	Yes	Yes	Yes
Estimation method	OLS-FD			GMM-FD		
IV	No	Yes	Yes	Yes	Yes	Yes
F(firms)	10579	10579	10579	10579	4037	10579
FxT(observations)	50199	50199	50199	50199	8613	50199

Note: Population: All manufacturing firms in Statistics Norways Capital Data Base. Estimation method: Except for Model 1, all models are estimated using GMM on first-differenced observations. Model 1 is estimated using OLS on first-differenced observations. Dependent variables: $log(V/T)_{ft}$ denotes log value added per hour by firm f at time t. C_{ft} denotes value of capital by firm f at time t measured using current prices , while T_{ft} denotes the total number of working hours by firm f at time t. W_{ft} denotes average daily wage of workers employed by establishment f at time t. FB_{ft} denotes average daily value fringe benefits of workers employed by establishment f at time t. $(FB+W)_{Nt}$ expresses average industry total compensation, where the industry average is calculated using observations of competitors (other firms operating within the same 4-digit industry code), only. IV-set: Instrument vector comprises firm-specific average of changes in workers' marginal tax rate (and squared), industry-specific average of log daily compensation (and squared), industry-specific average of proportion of fringe benefits in total compensation (and squared), the number of workers in the municipality employed by other firms with similar educational qualification, and cross-terms between these first-order terms. See Table A.IV in the appendix for further details on instruments. Robust standard errors adjusted for autocorrelation presented in parentheses. ^{x}, ^{y}, and ^{z} denote 1, 5, and 10 percent level of significance, respectively.

TABLE A.I
Descriptive statistics.

Individual level – duration regressions	ABU-sample (workers in establishments with more than 10 employees, public administration excluded)	
	Mean	Standard deviation
Hourly total compensation	200.10	115.19
Hourly wage	194.75	107.23
Hourly amount of fringe benefits	5.35	25.42
Pension scheme	0.86	0.35
Extended own-declaration of sickness absence	0.54	0.50
Private physician	0.17	0.37
Gym membership	0.56	0.49
Child care	0.06	0.23
Cleaning assistance	0.02	0.14
Holiday cottage	0.52	0.50
Extended holiday	0.28	0.45
Years of education (in excess of comp. school)	3.39	2.45
Woman	0.32	0.46
Short part-time (4-19hweek)	0.10	0.29
Long part-time (20-29hweek)	0.04	0.19
Job duration in years	7.59	7.18
Quit rate		
Job-to-job quit rate		
N (workers)	198228	

Individual level – quit regressions	Sample private sector workers 20-60 years of age	
	Mean	Standard deviation
Quit rate	0.279	0.449
Job-to-job quit rate	0.211	0.408
W_{ift}	701.78	424.26
FB_{ift}	11.74	79.16
ΔW_{ift}	53.671	217.533
ΔFB_{ift}	2.090	91.320
Alternative W_{ift}	681.717	264.019
Alternative FB_{ift}	10.558	11.716
Alternative start W_{ift}	536.553	187.438
Alternative start FB_{ift}	6.125	6.978
ΔW_{ift}XAlternative start W_{ift}	32690.53	159907.1
ΔFB_{ift} XAlternative start FB_{ift}	6.125	6.979
Fulltime worker	0.764	0.425
Change in marginal earning tax	-0.009	0.039
Pay-roll tax rate (%)	12.789	3.080
Proportion vacancies advertised in media	0.764	0.159
N (workers)	186123	
NXFXT	938314	

Firm level – productivity regressions	Manufacturing firms	
	Mean	Standard deviation
Log (Y/L)	-1.3709	0.6002
Log (K/L)	-2.7800	1.4692
F (proportion fringe benefits)	0.0132	0.0306
Hr	0.1694	0.1821
Log (W+FB)f/(W+FB)N	0.7334	0.6557
Firm-average change in marg. earnings tax rate	-0.0072	0.0179
Industry-average F in competing firms	0.0121	0.0115
Industry-average W in competing firms	5.7074	0.6744
Municipality-average labour supply comp.firms	5236.842	6989.969
F (firms)	10579	
FXT (observations)	50199	

TABLE A.II

The first-step regressions of Table II. First-difference-regressions.

Information on instruments.

Dependent variable	W_{ift}	FB_{ift}	W_{ift}	FB_{ift}	ΔW_{ift}	ΔFB_{ift}
Model	1	2	3	4	7	8
Pay-roll tax rate$_{mt}$	2.1225^{x}	0.1420^{x}	2.0617^{x}	0.1392^{x}	1.0203^{x}	0.0051
	(0.2855)	(0.0235)	(0.2788)	(0.0235)	(0.2796)	(0.0372)
Change in marginal tax rate contingent on earnings level$_{imt}$	-173.625^{x}	32.6828^{x}	-150.438^{x}	31.5412^{x}	-55.3066^{x}	34.3100^{x}
	(11.1946)	(6.0732)	(11.1026)	(5.9732)	(11.9197)	(8.4433)
Alternative W_{ift}			0.6657^{x}	-0.0005	0.1646^{x}	-0.0098^{y}
			(0.0071)	(0.0013)	(0.0086)	(0.0045)
Alternative FB_{ift}			-1.5445^{x}	0.3918^{x}	-0.6920^{x}	0.3061^{x}
			(0.1442)	(0.0561)	(0.1901)	(0.0908)
Alternative start W_{ift}					0.0097	-0.0004
					(0.0094)	(0.0028)
Alternative start FB_{ift}					0.2962	0.1021
					(0.2110)	(0.1581)
Dummies year, fulltime	Yes	Yes	Yes	Yes	Yes	Yes
Strength of instruments						
Anderson canonical corr. LR (P-value)	0.000		0.000		0.010	
Hansen J (P-value)	Not possible to calculate since the equation is perfectly identified.					
Cragg-Donald (N-L)*minEval/ L2 F-stat	18.44		19.43		3.36	
Partial R^2- of excluded instruments (F-values):	146.56	32.34	118.00	30.99	17.46	8.58
Instrument set used in models:	Table II: 2		Table II: 3,4,5		Table III: 2,3,4,5	
N(workers)	186061	186061	186061	186061	176395	176395
NxFxT(observations)	940170	940170	940170	940170	743809	743809

Note: W_{ift} denotes daily wage of worker i employed by establishment f at time t. FB_{ift} denotes daily value fringe benefits of worker i employed by establishment f at time t. ΔW_{ift} denotes daily wage growth of worker i employed by establishment f from period t-1 to period t. ΔFB_{ift} denotes daily value fringe benefits growth of worker i employed by establishment f from period t-1 to period t. Alternative wage and alternative fringe benefits: controls for average wage and average fringe benefits values for workers with similar educational qualification employed by other establishments. Alternative starting wage and starting fringe benefits value are calculated for workers with similar educational qualification just starting their employment relationship at other establishments. IV-set: Worker i's daily wage and daily fringe benefits values while employed by establishment f are instrumented by pay-roll tax rate and changes in the marginal tax rate. Robust standard errors adjusted for autocorrelation presented in parentheses. ^{x}, ^{y}, and ^{z} denote 1, 5, and 10 percent level of significance, respectively.

TABLE A.III

The first-step regressions of Table IV. First-difference-regressions.

Information on instrument.

Dependent variable	$NJPP_{ift}$	$NJFO_{ift}$	$NJFO_{ift}$
Model	1	2	3
Proportion vacant positions advertised in $media_{mt}$	-0.0256[x]	-0.0163[x]	-0.0162[x]
	(0.0059)	(0.0033)	(0.0033)
Alternative W_{ift}			0.00003[x]
			(0.000008)
Alternative FB_{ift}			-0.0002
			(0.0001)
Dummies year, fulltime	Yes	Yes	Yes
Anderson canonical corr. LR (P-value)	0.000	0.000	0.000
Hansen J (P-value)	Not possible to calculate since the equation is perfectly identified.		
Cragg-Donald (N-L) *minEval/ L2 F-stat	23.08	25.81	25.62
Partial R^2- of excluded instruments (F-values):	19.07	23.93	23.76
Instrument set used in models:	1,4,7	2,5,8	3,6,9
N(workers)	168533	168533	168315
NxFxT(observations)	724521	724521	721125

Note: Instrument: Proportion vacant positions advertised in media expresses the proportion of vacant positions in the municipality m at time t reported to the labour offices that are advertised in media. Dependent variables: the variable New job since previous period (NJPP) expresses an indicator variable taking the value of 1 if worker i employed by establishment f at time t was employed by a different employer at time t-1, otherwise it take the value of 0. The variable New job since first observation (NJFO) expresses an indicator variable taking the value of 1 if worker i employed by establishment f at time t has been employed by (a) different employer(s) earlier in the observation period, otherwise it take the value of 0. Alternative wage and alternative fringe benefits: controls for average wage and average fringe benefits values for workers with similar educational qualification employed by other establishments. Robust standard errors adjusted for autocorrelation presented in parentheses. [x], [y], and [z] denote 1, 5, and 10 percent level of significance, respectively.

TABLE A.IV

The first-step regressions of Table VIII. First-difference-regressions.

Information on instruments.

Dependent variable	Log(C/T)	FB / FB+W	Log(C/T)	FB / FB+W	Log(C/T)	FB / FB+W	Hr
Model in Table VIII	2		3			4	
Instrument vector, year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-dummies(2-digit)			Yes	Yes	Yes	Yes	Yes
No workforce change							
Strength of instruments							
Anderson canonical corr. LR (P-value)	0.000		0.000			0.062	
Hansen J (P-value)	0.252		0.236			0.125	
Cragg-Donald (N-L)*minEval/ L2 F-stat	4.665		4.69			1.49	
Partial R^2- of excluded instruments (F-values):	9.57	5.05	9.52	5.06	9.52	5.06	5.65
F(firms)	10579	10579	10579	10579	10579	10579	10579
FxT(observations)	50199	50199	50199	50199	50199	50199	50199

Dependent variable	Log(C/T)	FB / FB+W	Log(C/T	FB / FB+W	Hr	Log(FB+W) / FB_N+W_N
Model in Table VIII	5			6		
Basic instrument vector, year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry-dummies(2-digit)			Yes	Yes	Yes	Yes
No workforce change	Yes	Yes				
Strength of instruments						
Anderson canonical corr. LR (P-value)	0.095			0.061		
Hansen J (P-value)	0.133			0.359		
Cragg-Donald (N-L)*minEval/ L2 F-stat	1.50			1.34		
Partial R^2- of excluded instruments (F-values):	2.95	3.47	9.52	5.06	5.65	17181
F(firms)	186061	186061	10579	10579	10579	10579
FxT(observations)	940170	940170	50199	50199	50199	50199

Note: For the results of the second-step regressions and explanation of variables, see also Table VIII. Dependent variables in Table AIV express covariates in the second-step regressions of Table VIII. Instrument vector comprises firm-specific average of changes in workers' marginal tax rate (and squared), industry-specific average of log daily compensation (and squared), industry-specific average of proportion of fringe benefits in total compensation (and squared), the number of workers in the municipality employed by other firms with similar educational qualification, and cross-terms between these first-order terms. ^{x}, ^{y}, and ^{z} denote 1, 5, and 10 percent level of significance, respectively. Full regression results available from the author upon request.