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Absenteeism, efficiency wages and marginal taxes

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Abstract
This paper tests the argument that increased taxes on earnings corresponds with increased incentives to shirk, thus causing an increase in the rate of worker absenteeism. After accounting for fixed job effects, panel register data on prime-age Norwegian males that work full-time show that a higher marginal net-of-earnings-tax rate reduces the rate of absenteeism. When the net-of-tax rate is increased by 1.0 per cent then absenteeism decreases by 0.3 to 0.5 per cent. Injury-related absences are less affected than other absences by tax changes. Absenteeism becomes more sensitive to tax changes as the occupational unemployment rate increases.

Key words: Sickness absence, incentives, labour-related income tax reforms, panel data
JEL-code: H31, J22, J28, J32

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I. Introduction

In modern welfare states, taxes on earnings are vital for financing the provisions for public welfare. In public economics one of the major questions is how tax rates affect human behaviour. A multitude of studies have focused on earnings and labour supply responses to the implementation of tax reforms (for example Aaberge et al. (1995), Blundell et al. (1998), Gruber and Saez (2002) and Dagsvik et al. (2009)). The consensus today is that the relationship between the level of taxation on one hand and the labour supply of prime-age male workers on the other hand, is small. At the same time, the labour supply of married women is more sensitive to taxation levels (Saez et al., 2012). Recent studies of earnings responses typically yield elasticities of taxable income around of 0.12 to 0.40[1], which according to Saez et al. might imply additional behavioural responses. Similarly, we know that a comprehensive literature exists on how social insurance affects human behaviour regarding savings, work determination and retirements (Rust and Phelan, 1997; Gruber, 2000; Attanasio and Brugiavini, 2003; Attanasio and Rohwedder, 2003), where less generous social insurance rules usually imply higher labour supply, less non-participation and increased private savings.

The argument presented in this paper suggests that the tax system, which finances public sick pay, affects the propensity of workers to be absent from work due to sickness – or what is referred to here as sickness absence behaviour – thus influencing both public and private sick pay expenditures. This argument is tested here by using Norwegian register data on male workers between 20 and 60 years of age during the period 2001 to 2004.

[1] The estimated negative impacts vary quite considerably. Gruber and Saez (2002) report elasticity estimates ranging from 0.12 to 0.40, and the estimates made by Saez (2003) range from 0.0 to 0.40 depending on how income is measured. See also Saez et al. (2012) for a general survey of how taxable income is affected by tax rate changes.

The analyses presented here are important for several reasons. First, if workers change their labour supply by adjusting their levels of absence due to sickness following tax reforms in addition to making adjustments to other classical dimensions of labour supply, then the consequences of tax reforms should be evaluated not only by analysing the aggregated income effects of workers, but also by analysing the expenditures to sick pay, regardless whether or not this pay is publicly financed. When measured by direct cost, absenteeism is hugely expensive[2], especially when accounting for the indirect costs derived from the disruption of production. Second, the overall analysis bears evidence on how workers react to economic incentives. It is well known that when information on health is private, workers have incentives to shirk whenever wages paid during absence are – at least partly – covered by sick pay. Since worker absence is determined by equalising the marginal return to effort and the marginal costs of effort, and since the tax system affects workers' return to effort in the labour market, taxes on earnings affect the rate of worker absenteeism due to sickness. This line of thought thus follows from the wealth of literature on labour supply responses to tax or social insurance, and is related to the literature on how worker absenteeism is affected by incentives.

Most empirical evidence indicates that incentives matter for absenteeism, regardless of whether they are publicly or privately provided. Barmby et al. (1995), Johansson and Palme (1996), Henrekson and Persson (2004) and Ziebarth and Karlsson (2010) find that the rate of worker absence declines when wages are cut whenever a worker is absent. By utilising data on joint changes in the Swedish tax system over time in a country and cuts in sick pay, Johansson and Palme (2002) show that absenteeism decreases as the cost of absenteeism increases. In a study closely related to the topic of investigation in this piece, Ljunge (2010)

[2] According to Norway's National Budget 2010 publicly paid sick pay constitute 1.5 per cent of GDP (37.5 billion Nok) (http://www.statsbudsjettet.dep.no/upload/Statsbudsjett_2010/dokumenter/pdf/summary_national%20_budget_2010.pdf).

identifies a substantial price elasticity of sick leave, at -0.7, with respect to the net-of-tax rate on a 3 per cent sample of the Swedish population from 1974 to 1990.

Theoretically speaking, pay and sickness absence are related because wages are set by employers in ways that account for how costly absence is for them (Barmby et al., 1994; Engström and Holmlund, 2007), where higher wages imply less absence. Empirical studies of firm-provided incentives yield qualitative findings that are similar to those on public sick pay: workers reduce absenteeism in the face of incentives to do so. When examining panel data for 127 French firms from the period of 1981 to 1991, Brown et al. (1999) found that both profit-sharing and shared ownership significantly reduced the absence rate, although shared ownership was the most significant. It appears, however, that the presence of incentives is just as important as the strength of the incentives. For example, Hassink and Koning (2009) studied a lottery set up in two high-tech, capital-intensive plants owned by a large Dutch manufacturer, where employees who were not on sick leave for the last three months could win a coupon with a value of mere 75€. They found that the lottery was highly beneficial for the firm, in that the decrease in sick leave and sick pay exceeded the cost of setting up the lottery. Similarly, Engellandt and Riphahn (2011), when examining a large international company found that individual surprise bonuses caused employees to work longer hours while not affecting absence within the company.

To properly guide the empirical analyses, the theoretical modification adopted here embeds taxes into the theoretical model articulated by Barmby et al. (1994), and shows that this partial-equilibrium agency model predicts an increased probability of absence following a reduction in returns on labour market efforts caused by an increased marginal tax rate on earnings. In other words, a decrease in net earnings led workers to substitute leisure for work.

On the one hand, the graduated income tax system in Norway and the timing of events here seem ideally suited for my purpose. The timing is beneficial, since the tax legislation for the next year is made public at the end of the previous year, before workers make their sickness absence decisions. The graduated tax system is beneficial because of the highly non-monotonic relationship between the marginal tax rate on earnings and earnings growth. Thus the analyses here are not only able to exploit variations in the marginal tax rate caused by tax rate changes, but are also able to exploit variation caused by "bracket creep", which induces discontinuity effects (Saez, 2003). For those earnings levels that are relevant for the workers in this study the marginal earnings tax jumps at particular income threshold levels. For workers whose earnings are located within the distribution close to these threshold levels, a change in the tax system will have much stronger impact on the return to effort when compared to the average worker.[3] It is this discontinuity that will be exploited in the empirical analyses. On the other hand, this study will also have to deal with the danger of reverse causality – i.e., the levels of earnings determining the marginal earnings tax – and the problem that individuals with bad health and/or high demand for leisure often face low marginal taxes.

As pointed out above, the study here is related to the analyses conducted by Johansson and Palme (2002) and Ljunge (2010), but the analyses here differ along several dimensions. First, Johansson and Palme study changes in sick pay and tax changes jointly, thus making it hard to identify a pure tax effect. Moreover, Ljunge neither observe the risk period nor the actual number of sick days, but is forced to derive this latter number out from the total annual benefits claims. Second, shirking is empirically linked to the quality of the match between the firm and its employees (Nagin et al., 2002). Since absences due to sickness and shirking are related, poorly matched workers should be absent more often than workers in good matches. In other words, the quality of the match between a firm and its employees affects the level of worker absence. Thus the inability of Johansson and Palme to find significant impact

[3] Saez refers to "bracket creep" as the case of inflation-affected income and non-inflationary adjusted tax brackets. In Norway many workers face new brackets although these are adjusted to take into account inflation.

of the virtual income on the absence levels can be explained by workers in bad matches having lower virtual incomes. Similarly, if workers in bad matches have lower absence costs, a failure to take into account the quality of job-specific matches may overstate the negative effects of the cost of absence on absence. The overall analysis in this piece accounts for the match quality by controlling for fixed job effects. Third, while shirking-related absences are often theoretically analysed based on the notion of optimising workers, for certain illnesses a worker cannot choose whether or not to work. This is studied by conducting diagnose-specific analyses of the incidence rate of absences.

The structure of the remainder of the paper is as follows: Section II describes the tax reforms and the pay compensation system in Norway. Section III briefly presents an agency model of absenteeism that incorporates taxes. Section IV presents the empirical strategy adopted in this piece, while data is presented in section V. The main results regarding the impact that the net-of marginal earnings tax has on sickness absence are presented in section VI. In order to check the robustness of the results, tests are conducted analyzing if and how the results are related to specific illnesses, if they differ depending on the worker's position in the earnings distribution, if they vary between industries, and how they are related to a worker's risk of unemployment. These tests and extensions are presented in section VII. Finally, section VIII contains the concluding remarks.

II. Tax reforms and pay compensation for absent workers

The Norwegian tax system

The Norwegian marginal income tax changed during the period of 2000 to 2004 for inhabitants living outside of Finnmark, the country's northernmost county.[4] Figure 1 shows

[4] This is contingent on the assumption that these workers are not lone supporters of small children or otherwise taxed in tax class 2. In total 11 per cent of the Norwegian workers are taxed in Tax class 2 (majority women)

the marginal labor-related income tax rate for different labour-related income levels during our observation period. In a distinctly non-linear way, the marginal labor-related income tax rates for low income levels vary between 7.8 percent and 35.8 percent. Consider for example the tax legislation for 2003. For incomes less than 23,000 NOK the marginal tax is 0 percent. For earnings between 23,000 and 33,430 NOK the marginal tax is 25 percent, but then it drops to 7.8 per cent for incomes between 33,430 and 63,400 NOK. For incomes ranging from 63,400 to 132,500 NOK the rate jumps to 35.8 per cent, before falling back to 29.1 per cent for incomes between 132,500 and 190,400 NOK. For labour-related incomes between 190,400 NOK and the first threshold for the top tax brackets, i.e., 347,000 NOK in 2003, the marginal tax then stays at 35.8 percent. The marginal tax rate varies considerably at lower income levels, but less so at the average or higher levels of incomes. The median worker faces a marginal labour-related tax rate of 35.8 percent. As the income levels increase into the top tax brackets, then the marginal tax rate first increases to 49.3 per cent and then to 55.3 per cent. Once again, consider year 2003 as an example. If the worker earns less than 347,000 NOK as described above, then the worker faces a marginal income tax rate of 35.8 per cent. For incomes between 347,000 and 872,000 NOK the tax rate is 49.3 per cent, but it jumps to 55.3 per cent for incomes above 872,000 NOK.

Finally, what happens to non-labour income taxes during our period of observation? During this period no qualitative changes occurred in capital taxation (fixed at 28 per cent) nor in mortgage deductions. Furthermore, several non-wage remuneration elements (e.g., stock options) are reported and taxed as labour-related income.

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whereof 4 percentage points constitute lone supporters (strong majority women). Thus the percentage of our workers that can be assumed to be taxed in tax class 2 is small, because they are men and not lone supporters. The inference made here is that on average 1-2% are wrongly classified. At the same time, some of the regressions performed in this study control for small children and marital status, and thus the consequences of this misclassification should be minor.

The discussion above and the presentation in figure 1 reveal three facts. First, the tax brackets are adjusted by the Ministry of Finance to take into account inflation and to reflect redistributive policy changes, leaving less room for “bracket creep”(Saez, 2003). Second, the threshold levels for the top tax brackets change considerably during our period of observation. Third, small income changes may still yield quite a strong impact on the marginal tax rate.

[Figure 1 around here]

The Norwegian sick pay system

The public sick pay system in Norway is archetypical of a generous Scandinavian welfare state. Public employees receive complete compensation of fixed pay regardless of their salary level. Private sectors workers on fixed pay contracts are provided “complete” compensation for 1 year if their salaries are less than 6G (G=baseline level public social insurance system, roughly 48,377 NOK in 2000 and increasing to 58,139 NOK in 2004). The average yearly salary for a full-time male manufacturing worker is close to 6G. In 2004, 45 per cent of all private sector workers (excluding public administration, health care and education) earned more than 6G. The private sector employers are free to offer top-up compensation for workers earning more than 6G. In workplaces employing more than 10 employees roughly 40 per cent of the private sector workplaces offered these top-ups in 2003. The employer provision for top-up sick-pay compensation is a practice that is not particular to Norway, but one that is also seen in other countries with robust welfare provisions (Barmby et al., 2002).

Even when workers’ salaries are less than 6G, the compensation for absence due to sickness is not necessarily 100 per cent of the benefits accrued from going to work. First, for workers operating under a pay regime based on individual performance, absences might result in lost bonuses. If the absence is detrimental to team performance, then bonuses can also be lost under a regime with team incentive devices. Thus, under a performance-pay regime it is hard to talk about full compensation. In 2003, close to 50 per cent of Norwegian private sector workers operated under a performance-pay regime (Barth et al., 2008). Therefore, a substantial proportion of Norwegian workers do not experience complete compensation for sick days. Furthermore, absence from work also means lost opportunities at work for earning extra pay, for instance from overtime payment. Finally, absence may also negatively affect future career opportunities, thereby resulting in lost earnings which are not compensated for through the sick pay. Markussen (2012) finds that increasing the rate of absence by 1 percentage point yields an earnings loss of approximately 405 US $, indicating that pay for work is not fully compensated for by sick pay.

Based solely on a self-declaration of illness, each worker may be absent for up to 4 separate periods over the course of 12 months. All absences lasting at least 4 days have to be physician-certified, in which case the first 3 days are incorporated into the duration of the absence spell. Absences that exceed four periods over the course of 12 months must be physician-certified regardless of their duration. Statistics Norway for 2008 estimates that self-certified absences are one-fifth the rate of physician-certified absences.[5] As is described in the data section, the dataset in this piece comprises information on all male workers, but only physician-certified absences are registered. Hence, I cannot differentiate between workers with no sickness absences and those with absences based on self-declarations.

III. Theoretical background

The theoretical perspective adopted in the analyses is based on the efficiency wage model developed by Barmby et al. (1994). However, the model is augmented through the incorporation of mechanisms that account for income taxes (albeit in a partial equilibrium manner). The primary purpose is to construct a theoretical model for the empirical analyses that follows. Let δ represents and index of workers' general level of health, where δ in [0,1]. As a worker's health deteriorates, implying $\delta \rightarrow 1$, he or she experiences a higher valuation of

[5] http://statbank.ssb.no/statistikkbanken/

leisure. The firm offers a contract specifying a fixed number of work hours, denoted by *h*. For workers who are present, the firm's pays fixed wages, as denoted by *w*. Furthermore, the firm pays sick compensation to absent workers based on a notion of acceptable illness rather than on observations of the actual health of the workers. The value of sick pay is greater than the options faced by workers outside the workplace, which are basically governed by the unemployment insurance i.e. sick-pay compensation rate=s>b=unemployment insurance rate. For the sake of simplicity, we assume that all three options, – i.e., employed and non-absent, employed and absent, and unemployed – face the same proportional marginal tax rate of *t*, thus (1-*t*) expresses the *net-of-tax rate*.

This means that the workers face three utility alternatives:

$$U_{na}=(1-\delta)(1-t)^{\gamma}w+\delta[T-h],\quad U_a=(1-\delta)(1-t)^{\gamma}sw+\delta T,\quad U_u=(1-\delta)(1-t)^{\gamma}bw+\delta T. \qquad (1)$$

Parameter γ expresses how sensitive utility is to taxes. If the parameter is positive, utility depends on the net-of-tax earnings. By contrast, if $\gamma=0$ then the earnings tax does not affect workers' utilities nor their absence behaviour. From the three alternatives depicted in 1) above, it can be derived that a worker will never work if $\delta > \delta_b = \frac{(1-t)^{\gamma}(w-\mathrm{b}w)}{(1-t)^{\gamma}(w-\mathrm{b}w)+h}$, and that there exists an indifference limit $\delta_a = \frac{(1-t)^{\gamma}(w-\mathrm{s}w)}{(1-t)^{\gamma}(w-\mathrm{s}w)+h}$, thus making the worker indifferent between absence and non-absence. We assume that the acceptable illness level, as denoted δ_z, for which sick pay, s*w*, is correctly paid, is in [δ_b, 1). However, $\delta_a < \delta_b$, and thus the workers have incentives to overstate their true sickness and consequently to "shirk".[6]

[6] "Shirking" may involve absence due to sickness based on self-declared absences and on physician-certified absences. Physicians in Scandinavian countries rarely deny declarations of sickness (Englund et al., 2000; Wahlström and Alexanderson, 2004; Carlsen and Nyborg, 2009). In Norway sick pay is assumed to "completely" cover the wage, while unemployment benefits are usually paid at two-thirds of the wage level.

To discover the worker's true health, the firm may pay k for each worker to achieve a positive probability α of discovering the workers' true state of health. So, α expresses the probability of discovering that a worker is shirking, who would then be fired. Since unemployment insurance is assumed to be less than the sick pay, the positive probability of being fired when shirking alters the worker's behaviour. The expected utility of shirking is a weighted sum of the utility from being unemployed and the utility from being absent, where the probability of being caught shirking and the probability of not being caught shirking act as weights. Thus, there exists a reservation sickness level of $\delta_c = \frac{(1-t)^{\gamma}(w-\beta w)}{(1-t)^{\gamma}(w-\beta w)+h}$, where β= [αb+(1-α)s], such that $U_{na}(\delta_c) = \alpha U_u(\delta_c) + (1-\alpha) U_a(\delta_c)$. The term δ_c will be in (δ_a, δ_b). This means that regardless of the completeness of the sick pay, a "shirking" or absent employee faces the danger of losing his or her job and then receiving the lower alternative wage in the form of unemployment benefits. The probability of absence is expressed as:

$$\Pr(absent) = 1-\delta_c = 1-\frac{(1-t)^{\gamma}(w-\beta w)}{(1-t)^{\gamma}(w-\beta w)+h} = \frac{h}{(1-t)^{\gamma}(1-\beta)w+h} = \frac{1}{1+(1-t)^{\gamma}(1-\beta)w/h}, \qquad (2)$$

where ∂Pr(absent)/∂*w*<0.

In equation 2), when *t* is a fixed parameter, we see that an increase in t implies an increase in the probability of being absent – i.e., ∂Pr(absent)/∂*t*>0. This is true even when sickness absence is fully compensated. Indeed, when hours are contracted and fixed, the decline in the labour market's return for effort entices workers to substitute work with leisure, thus raising the likelihood of being absent. This relationship is complicated when the marginal

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Thus, the Norwegian system implies $\delta_b = \frac{(1-t)^{\gamma} w}{(1-t)^{\gamma} w + 3h}$ and δ_a=0. Therefore all workers have incentives to overstate their true illness. Employment protection legislation (EPL) in Norway does not prohibit the firing of workers who repeatedly shirk on the job. Norway is ranked around average in 2003 by OECD when comparing EPL-levels for workers in the OECD-area (OECD, 2004:117). This process might take time, involve the courts, and be costly.

tax rate varies with the wage as in a graduated or progressive tax regime, for example so that bw and sw are taxed at lower rates and/or wages are not fixed. Under certain simplifying assumptions, this may be incorporated into the current arrangement of the model. Assume that bonuses are not covered by sick pay, that sick pay and unemployment benefits are taxed at a lower rate than non-absent pay, and that net-of-tax pay when attending work is always at least as high as net-of-tax pay when absent or unemployed. Then $(1\text{-}t)_s=(1\text{-}t)t_s$ (net-of-tax sick pay) and $(1\text{-}t)_b=(1\text{-}t)t_b$ where $t_s>1$, $t_b>1$, and $(1\text{-}t)$ expresses the net-of-tax when attending work.

The workers' utility alternatives can then be expressed as:

$$U_{na}=(1-\delta)(1\text{-}t)^{\gamma}w+\delta[T\text{-}h],\;\; U_a=(1-\delta)((1\text{-}t)t_s)^{\gamma}sw+\delta T,\;\; U_u=(1-\delta)((1\text{-}t)t_b)^{\gamma}bw+\delta T. \quad (3)$$

Parameter γ still expresses how sensitive utility is to taxes. As before, we can derive expressions for δ_a, δ_b, and δ_c, and express the probability of absence as:

$$\Pr(absent)=1-\delta_c=1-\frac{(1\text{-}t)^{\gamma}(w-\beta w)}{(1\text{-}t)^{\gamma}(w-\beta w)+h}=\frac{1}{1+(1\text{-}t)^{\gamma}(1-\beta)w/h}, \quad (4)$$

but where β now expresses $\beta=[\alpha t_b^{\gamma}b+(1-\alpha)t_s^{\gamma}s]$. Increasing the baseline tax rate t still implies that the probability of being absent increases – i.e., $\partial\Pr(\text{absent})/\partial t>0$. Thus, increasing the progressivity in the tax system means that sick pay and unemployment benefits are taxed at lower rates relative to non-absent pay, which also increase the probability of being absent.

This model implies that the disposition of workers to take sickness absence is influenced by the consequences of becoming or being unemployed. When the consequences of unemployment are minor, then the behaviour of workers is also less affected by the changes in the net-of-tax rate. While the Norwegian employment protection legislation does not prohibit the firing of shirking workers, it is time consuming and costly to fire workers who can produce physician-certifications for their absences, at least when the duration of these absences are less than a year (the legislation allows firms to take steps to terminate the employment relationship after a stretch of one year).

At the same time, workers who are frequently absent need to worry about how these absences influence their current and the future career paths (as indicated by Audas et al.(2004)). During reorganisation processes firms might try to get rid of less attractive (e.g., absent-prone) workers. In the literature on absenteeism (Leigh, 1985) it is well-known that unemployment acts as a worker discipline device (Shapiro and Stiglitz, 1984). A positive relationship between absence and labour market tightness is also observed in Norway (Nordberg and Røed, 2009). Therefore, it is argued here that the theoretical model described in this piece provides insights that are relevant for Norway as well.

Finally, the main result from Barmby et al.(1994), that a firm's optimal response to an increase in its monitoring costs, was to reduce costly shirking by raising wages, will be unchanged. However, as workers are increasingly taxed, firms will raise wages at a decreasing rate. Thus, the labour response following tax increases is magnified by firms' behaviour.

IV. Econometric models

The main econometric model is derived from equation 2), which transforms into an expression that follows the logistic distribution describing the absence probability of worker i:

$$\Pr(absent_{it}) = \frac{1}{1+(1-t_{\mathrm{it}})^{\gamma}(1-\beta_{\mathrm{it}})\mathrm{w}_{\mathrm{it}}/\mathrm{h}_{\mathrm{it}}} = \frac{1}{1+e^{-\{-\gamma\ln(1-t_{\mathrm{it}})-\mathrm{f}(\beta_{\mathrm{it}},\mathrm{w}_{\mathrm{it}},\mathrm{h}_{\mathrm{it}})\}}}. \qquad (5)$$

$(1-t_{it})$ expresses the marginal *net-of-tax rate* of an individual i at time t based on the tax rules of time t. The latter function f(.) combines variables that express the replacement ratio, unemployment benefits ratio, monitoring, earnings and contracted hours (in its simplest form f(.) constitutes these variables in log-form). One can also derive equation 5) from equation 3).

In Norway, and in many other countries, the marginal tax rate t_i of an individual i is an increasing function of reported earnings. Such a tax function may also vary between regions, marital status, and other characteristics governed by the tax legislation, and it may of course change as the years go by. As discussed in section II, absences might affect earnings, thus potentially making $(1\text{-}t_i)$ endogenous in equation 3). One might also worry that workers with bad health and/or high demand for leisure have low marginal tax rates. Since true health is unobserved, this will cause a negative bias in γ.

To address these problems it is assumed here that workers have adaptive expectations on earnings – i.e., anticipated earnings for the current period and the previous period earnings are equal. Based on the tax rules of time t, the anticipated marginal *net-of-tax rate* of worker i at time t, $(1\text{-}\tau_{it})$, is then given directly from the anticipated earnings for the current period. The tax rules for a specific year are published at the end of the previous year (November-December), and so these rules influence the behaviour the following year. Thus $(1\text{-}\tau_{it})$ expresses a *synthetic marginal net-of-tax rate* given that the tax legislation of time t is conditional on the earnings of time t-1 – i.e., it measures the marginal net-of-tax rate of the worker under the new tax legislation contingent on the fact that he or she will earn the same as the previous year. An alternative tax measure based on inflation-adjusted earnings (inflation primarily given by the growth in social service baseline figure) is also studied as a robustness check. The unadjusted tax measure is preferred because this is the simplest and uncertainty regarding how workers form expectations regarding future income growth. These measures are also discussed in section V.

To acknowledge that the realised net-of-tax rate may deviate from the anticipated net-of-tax rate, an error function g(.) so $\ln(1\text{-}t_{it}) = \ln(1\text{-}\tau_{it}) + g(w_{it}, w_{it-1}, h_{it}, h_{it-1}, X_{ij}, \upsilon_{it})$ is introduced. Wages and hours (thus earnings) and other observable controls are arguments found in the g-function, but also υ_{it} which expresses an unobservable error term. Inserting this into 5) yields:

$$\Pr(absent_{it}) = \frac{1}{1 + e^{-\left\{-\gamma \ln(1-\tau_{it})^{E} - \gamma g(w_{it}, h_{it}, w_{it-1}, h_{it-1}, X_{it}, \upsilon_{it}) - f(\beta_{it}, w_{it}, h_{it})\right\}}} = \frac{1}{1 + e^{-\left\{-\gamma \ln(1-\tau_{it})^{E} - \pi' Z_{it} + \Phi_j + \phi_t\right\}}} \quad .(6)$$

The linear combination of g(.) and f(.) is expressed by the Z-vector, time dummies (represented by φ_t) and an unobserved fixed job effect (represented by Φ_j), that takes into account both fixed individual effects and fixed workplace effects. Therefore, while one ideally would control for the unobservable υ_{it}, the analyses here are only able to control for $\varphi_t + \Phi_j$. However, the detailed control vector Z comprises a wide range of current and lagged variables, thus arguably capturing much of the remaining variation in υ_{it}. To take care of the fixed job effect, equation 6) is estimated using a conditional logit approach.

Since the empirical analyses take into account fixed job effects, the identification of γ rests on the variation of the synthetic net-of-tax rate $(1-\tau_{it})$ within a job over time. This variation occurs only if lagged earnings change or if the tax legislation changes. Since the estimation of equation 5) always incorporates control for lagged earnings, identification will primarily rest on changes in the tax legislation. Furthermore, if the estimate of γ is basically unchanged when the current period's earnings and other control variables are added to the regressions, then it is less likely that the original estimate is suffering from reverse causality.[7]

Decisions on absence due to sickness may depend on labour market conditions, and these may be correlated with the synthetic net-of-tax rate. To avoid having γ measuring fluctuations in labour market conditions, the Z-vector in equation 6) is modified by adding controls for local labour market tightness (regional vacancies relative to unemployment), relative job growth within the industry (3-digit NACE industry), average co-worker wages and wage growth of similarly educated workers employed by other firms. To normalise the risk period the number of working days is logged and incorporated as an offset variable in the regressions.[8]

The derived model describes how the incidence rate of sickness absence is related to the net-of-tax rate. It is easy to imagine cases where a worker is unable to influence the onset

[7] Within the literature on the elasticity of taxable income with respect to the marginal tax one finds concerns about mean reversion. This is less of an issue in the case presented here. Since absence due to sickness is heavily compensated, there is no one-to-one relationship between absence and tax through earnings.

[8] Contracted work hours and risk period matters (Barmby et al., 2001). If workers can adjust full-time hours offsets might cause the γ-estimate to be biased towards zero. The log of the number of yearly work days is also incorporated as an ordinary control variable for robustness check.

of illness. However, the decision when to return to work is clearly more to the discretion of the worker. Thus, the duration of an absence is influenced first by the decision to take an absence and then by the decision on when to return to work. Tax considerations might, therefore, be more significant when determining the number of days absent than for the absence incidence rate. In light of this, the study here focuses on how the number of the absent days relative to the number of working days is affected by the tax changes. This is done by estimating a conditional Poisson-regression equivalent to Equation 6).

How tax changes affect the probability of absence and the duration of absence for different kinds of illnesses is addressed, simply because certain kinds of illnesses are less likely to be at the discretion of the worker. Instances where discretion is absent are less likely to be influenced by shirking. Acknowledging that the rules governing firm-provided sick-pay vary between industries, with the potential to variably influence absence decisions of workers, industry-specific analyses are conducted. Since the model implies that the absence behaviour of workers is less affected by the changes in the net-of-tax rate when workers can be less concerned about the consequences of becoming or being unemployed, occupation-specific effects are estimated by comparing occupations with high unemployment rates to those with low rates.

Unfortunately, some potential weaknesses related to the estimation still remain. First, although commonly used, the conditional logit- and the conditional-Poisson model share the same drawback: Both yield a considerable loss of observations, because only those workers who were absent due to illness at least once during 2001 to 2004 actually contribute to the identification of the models.[9] For example, roughly 500,000 workers were absent from work once during this period thus some 350,000 workers are excluded from the analysis. However, by accepting this drawback, the study is able to account for unobservable fixed-job effects.

[9] The 2004 observations are included regardless of the decisions in 2005 to work part-time. Excluding the observations of workers who begin to work part-time in 2005 does not qualitatively affect the results.

These fixed effects thus control for permanent differences in e.g., match quality, working conditions, job tasks, working hours, leisure preferences, and replacement rates, which are important for absence rates (Leigh, 1991; Barmby et al., 2001; Ose, 2005; Bolduc et al., 2002; and see Section I).

Second, the dynamic relationship between absence, wages, taxes and replacement rates is complex, and time-varying unobserved characteristics may still cause problems. If replacement rates, bonuses and overtime hours or even individual evaluation of leisure vary over time and is related to taxes, then this may influence the estimates, even if as seen from equations 4) and 6) certain simplified relationships are taken into account by the empirical strategy.[10] Saez et al. (2012) criticise the use of synthetic tax rates based on lagged earnings, since real economic growth might cause a correlation between income and time, but this is clearly more problematic in income regressions than in absence regressions where one controls for lagged and even current income.

V. Data

The linked employer-employee data set, or more precisely the data system, is based on public administrative register data. It originally comprised *all* firms, workplaces in Norway for the years of 2001 to 2004, as well as all persons employed on May 15th of each year within the same time frame. It provides information on jobs, including seniority, spell-specific earnings and thus combined with spell length daily wage, weekly working hours (intervals, exact hours

[10] As seen in Section I higher replacement rates are usually positively correlated with absence rates. Since the replacement rate would seem to be lower for individuals with high incomes, it is positively correlated with the net-of-tax rate. Omitting the replacement rate in simple linear models thus biases the effect of the net-of-tax rate toward zero. A similar bias arises from omitting bonus or overtime, since bonuses and overtime are positively correlated with income, i.e., they are negatively correlated with the net-of-tax rate, and they are negatively correlated with absence (you can't work overtime nor do bonus inducing work when absent).

2002-2004), hourly wage (only 2002-2004, calculated from earnings, spell length and the exact weekly working hours). The data also provide information on worker illnesses (sickness absence spells[11], physician-certified illness diagnosis[12]), and worker demographics, including gender, educational qualifications, income, occupations (all from 2003 and for non-job changers from 2001, and for roughly 15 per cent in 2001-2 imputed using 6-digit educational qualification and 5-digit industry codes)). Finally, the data set includes specific information on firms and workplaces, including firm-and establishment identifying numbers, industry classification (5-digit NACE), sector and municipality codes. Since each individual, each establishment and each firm in the data are identified by unique encrypted numbers (separate series) workers and workplaces can be tracked over time.

From this data system *all male full-time workers between 20 and 60 years of age* are selected. This sample constitutes workers who are strongly attached to the labour market, and avoids complications related to pregnancy. Women work part-time much more often than men, and pregnancy is strongly and positively associated with sickness absences. Roughly 60 per cent of the workers experience at least one physician-certified absence during the period of observation. The remaining 40 per cent are registered as taking no sick days. Table A1 in the appendix presents descriptive statistics on key variables for observations contributing in the regressions. The relatively fewer days absent in 2001 are due to the creation of the absence register during the 2nd quarter of 2000, thus affecting the duration measurement of very long absences (discarding observations from 2001 does not qualitatively change the results).

[11] The start and stop dates of absence and job spells are known. These spells contain weekends and public holidays, since we do not known if a worker really works or is off work on weekends and holidays.

[12] Purely work-related injuries cannot be identified. The injury measure includes: i) work related injuries, which are treated by physicians, but not reported to the authorities, ii) work related injuries, which are treated by physi-cians and reported to the authorities as work place accidents, and iii) non-work related injuries.

This section is brought to a close by taking a closer look at the tax changes. Variation in taxes occurs only if lagged earnings change or if the tax legislation changes. Table 1 depicts the yearly differences between the observed marginal tax rate for period t-1 and the corresponding synthetic tax rate for period t for those experiencing strictly positive or negative differences (implying anticipated tax changes). The overwhelming majority anticipates no changes. The synthetic tax figures in panel A) are based directly on lagged income. The synthetic tax figures in panel B) are based on inflation-adjusted lagged income (inflation equal to the growth in the social service baseline figure). Thus, the two panels reveal statistics for different workers. As is plainly evident, panel A) focuses to a large extent on those workers with income close the thresholds from above, where tax cuts would be the primary anticipation.[13] Similarly, panel B) focuses on those with incomes that fall close to the thresholds from below, where tax increases would be anticipated. As noted, the preferred figures are reported under panel A), but for workers expecting income growth panel B) provides a better picture (see also note 14). The panels also show the average number of sick days across the years within each tax bracket. While there are fewer days absent at higher tax levels when compared to lower tax levels (reflecting income), it indicates a negative correlation between tax growth and days absent.

[Table 1 around here]

Since lagged earnings might also change over time, this might translate into the synthetic tax rate changes over time. Table 2 reports the within-job transformed non-inflation adjusted synthetic tax rate (the synthetic tax rate period t minus the job-specific average of the tax) and the similar within-job transformed average sick days. The higher the synthetic tax

[13] In most cases it is easy to identify the synthetic tax from the tax given by the column head and the table element values, but not for a tax of 35.8. As is seen in Figure 1, a marginal tax of 35.8 occurs for two income intervals, with the majority of workers belonging to the upper interval. Tax cuts imply for most workers a drop to 29-30 percent, but a few workers face 7.8 percent, thus the table element in this case reports an average.

rate, the more positive the average within-job tax rate is. At most tax levels, however, both positive and negative within-job transformed tax rates are observed, thus indicating the occurrences of positive and negative tax growth. For each year in this period positive within-job transformed tax rates, as opposed to those rates that are negative, appear to correspond with a higher number of within-job transformed absence days. Thus, it indicates that absenteeism might be related to the tax policy.

[Table 2 around here]

VI. Main empirical results

The simple descriptive statistics reported in tables 1 and 2 revealed that when compared to tax cuts, tax hikes were on average associated with more days absent. By controlling for fixed job effects, the regressions in this section account for the fact that jobs may differ depending on their propensities to elicit absences. Moreover, by non-parametrically controlling for age and earnings, the regressions also account for the fact that absence depends on age and earnings.

Table 3 presents the main results regarding how the net-of-tax rate affects the incidence rate of sickness absence and the number of sick days taken by workers. Model 1 controls for ages (5 year intervals) and earnings for the previous period (decile dummies), while model 2 adds controls for earnings during this period (decile dummies). Model 3, which serves as the reference specification, adds a time-varying control vector that comprises logged workforce size, average co-worker wage, regional vacancy per unemployed, industry wage growth rate, educational group wage growth rate, and rate of absence due to sickness for similarly educated women. The idea is that this control vector will capture time-varying shocks that affect workplaces, industries, regions and educational qualifications. In these regressions the log of yearly employment days is included as an offset variable, thus making the estimated parameter associated with the logged net-of-tax rate interpretable as an elasticity. The standard errors are bootstrapped, based on 100 replications.

[Table 3 around here]

In all the regressions, the logged net-of-tax rate has a significant and negative effect on sickness absence. Models 1 through 3 reveal that if the net-of-tax rate increases by 1 per cent then the incidence rate drops by 0.18 to 0.20 per cent. In the reference model, the elasticity is estimated at -0.18. The relative number of sick days is even more negatively sensitive to the net-of-tax rate. Thus, if we take into account fixed-job effects, and the time-varying shocks that affect workplaces, industries, regions and educational qualifications, we are still left with a considerable negative elasticity of -0.31. In other words, if workers experience a 1 per cent increase in their net-of-marginal income tax rate, then the relative number of days lost due to sickness is reduced by 0.31 per cent. It is hard to see how such a large elasticity, which indicates significant labour supply responses following tax reforms, coincides with non-negligible cost of funds.

Next, models 4 through 7 act as robustness checks. In model 4 the tax measure is replaced by the corresponding inflation-adjusted tax measure (see Section V and footnote 14). Model 5 relaxes the offset-assumption on the logged yearly employment days, and adds this as an ordinary control variable. Model 6 captures the replacement of the 9-decile dummies for earnings in the previous period with 19 dummies based on 5-percentile intervals. Finally, model 7 contains additional control variables such as 8 seniority dummies, the number of children less than 7 years of age, the number of children less than 18 years of age, a dummy for married, and non-labour related income (and squared). The estimates of model 4 decline considerably, but are still sizeable and significant.[14] As seen in Models 5 through 7, the

[14] Since each worker's true expected wage growth is not observed, the unadjusted and the inflation-adjusted tax measure can be interpreted as affected by measurement errors. Attenuation usually makes estimates biased towards zero. If the errors are negatively correlated with the absence levels, the preferred unadjusted tax measure will possibly yield a too strong negative relationship between absenteeism and the net-of tax-rate. For the inflation-adjusted tax measures such errors will weaken the negative relationship. Arguably the "true" relationship is bounded between the estimates of Model 3 and Model 4, still indicating a considerable impact.

estimated elasticities change very little from what were found in model 1 through 3, and vary between -0.32 and -0.34 for the incidence rate or -0.41 and -0.5 for the number of days absent.

Finally, one might argue that the analyses should explicitly account for the potential income effects by deriving and estimating a compensated elasticity. It could then be possible to identify additional income effects by incorporating a measure for non-taxable income (see for example, Ljunge (2010)). First, when sick leaves are heavily compensated, to a certain degree income effects are taken care of by the fixed-job effects approach. Second, empirically speaking the scope for additional income effects is limited. The estimated elasticities reveal little variation across the models (with/ without current income, current non-labour income, marital status, and the number of children). Third, the variation of the non-taxable income over a 4 year period for a worker is also quite limited, thus being accounted for by the fixed effects. Fourth, from the figures for Sweden that were reported in Ljunge (2010), these income effects, while present, appear to be relatively minor.

VII. Empirical robustness checks and extensions

This section includes several robustness checks designed to study the sensitivity of the results. These analyses also provide additional information, so they have a value on their own terms. The regressions incorporate controls that are similar to those utilised in model 3 in table 3.

Specific illnesses

It is not obvious that all kinds of sickness absences can be understood in an efficiency wage framework. In other words, workers might not be able to decide on whether or not to attend work when faced with certain kinds of illnesses. Three broad categories of diagnoses have

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Qualitatively unchanged regression results follow if the analyses are based on a combination of the two tax measures or if anticipated earnings the current period were inflation-adjusted based on the average industry wage growth for the previous period.

been selected: i) muscular-skeletal diseases, ii) psychiatric diseases, and iii) absences related to injuries, such as broken legs, ankle injuries, dislocation, and burns. Regressions are then estimated separately for each of these diagnostic groups. Table 4 presents the results. All categories contain highly significant and negative relationships between the net-of-tax rates and the absence rates, but the injury-related absences are less sensitive to the net-of-tax rate when compared to other illnesses. Muscular-skeletal diseases appear to have relationships that are similar to those found in the previous table, while the psychiatric diseases are even more strongly related to the net-of-tax rates. These results seem to suggest that when faced with certain kinds of illnesses, workers have little discretion over work attendance. When faced with these illnesses, economic incentives have a weaker effect on the behaviour of workers.

[Table 4 around here]

Earnings thresholds

One of the implications from the theoretical model is that changes in the earnings tax should affect sickness absence regardless of whether or not compensation is not fully provided when absent. The impact may, however, vary depending on the degree of compensation and on the level of earnings. Furthermore, the descriptive statistics presented in section V indicated that heterogeneous absence behaviour across different income groups might be important for the results of the research presented here.

In light of this importance, focus is directed to the relationship between the net-of-tax rates and absence for different populations, depending on their earnings the previous year. [15] Table 5 presents the results from these regressions. Differences are found between models 1 through 6 largely due to differences in the income thresholds. Model 1 focuses on workers who earn strictly more than 1G, model 2 focuses on workers who earn more than 2G, and so

[15] This approach is chosen instead of conducting separate analyses within each earnings bracket, because the number of full-time workers in the lowest brackets is limited.

on for the models that remain. Model 6 is particularly interesting to the extent that the income for workers within this category is above the limit for the public sick pay system.

The results of table 5 show surprisingly little variation. For all observed earning levels, a strong and negative relationship is found between net-of-tax rate and absence due to sickness, but the strength of this relationship drops somewhat for higher income levels. However, if one was worried that the previous results were really driven by heterogeneous absence behaviour for different income groups, the data presented in this table should alleviate that worry. The conclusion drawn here is that the negative relationship between the net-of-tax rate and absence due to sickness is not only related to low-paid workers. This negative relationship is a pervasive phenomenon observed in all income groups.

[Table 5 around here]

Specific industries

Earnings and absences vary between industries, and thus one might wonder about the extent to which the previous results somehow reflected industry differences. This concern is tested by studying the relationship between the net-of-tax rate and absences due to sickness within a selection of major industries (the fixed-effect approach requires a certain number of observations thus making it difficult to analyse minor industries). Therefore, five major industries were selected: i) manufacturing, including oil and power generation, ii) construction, iii) trade, iv) education and v) health and social services. As presented in table 6, regressions were estimated separately for each of these industries. The results of table 6 reveal a strong negative relationship between the net-of-tax rate and absence. The level of significance varies somewhat, but the point estimates are indeed considerable. The negative relationship appears weaker in manufacturing and construction, and stronger in trade, education and health and social services.

[Table 6 around here]

The sensitivity of absenteeism to tax changes and how this depends on occupational unemployment

This final sub-section entails a test of whether the propensity of workers to take sick days is less affected by changes in the net-of-tax rate when workers can be less concerned about the consequences of becoming or being unemployed. Therefore, table 7 shows how sensitive absenteeism is to tax changes for 6 specific occupational categories: i) natural science, such as biologist, geophysicists, engineers, architects, technicians, ii) health and social care services, which includes nurses, physicians, dentists, veterinarians, social workers, iii) retail and sales, such as shop workers and sales clerks), iv) construction, such as carpenters and plumbers, v) industrial occupations, such as electricians, welders, mechanics, operators, and vi) management, comprising CEOs, CFOs, CHROs, and daily managers. Occupations i) and ii) are comparable with respect to the years of education, although they differ of course with respect to institutional sectors. Similarly, occupations iii) through v) can also be argued as being rather comparable. As seen in table 7, these six occupational groups face very different unemployment rates, thus providing the basis for the admittedly simple test. The striking result depicted in table 7 is how the sensitivity of absenteeism to tax changes decreases for comparable groups as the average unemployment rate decreases, with least sensitivity and least unemployment for the management group.[16]

[Table 7 around here]

VIII. Discussion and conclusion

For decades, researchers have studied how negative financial incentives impact on absence due to sickness. At the same time, however, far less attention has been paid to the potential effects that the income tax system has on absences. During the period of 2001 through 2004,

[16] Estimating an OLS regression on these 6 data points between the sensitivity expressed by the elasticity and the unemployment rate even reveals this relationship as significant.

several changes occurred in the Norwegian income tax system. In the sample analysed here, 30 per cent of the workers experienced changes in their marginal income tax rates, either due to tax changes in the form of changes in brackets or changes in tax level within brackets, or due to changes in earnings.

The analyses reveal that when workers expect to be taxed more leniently – i.e., when their labour market returns for effort increases, as expressed by the net-of-tax rate, the probabilities of their absence from work due to sickness decline. Both the incidence rate and the relative number of lost work days decrease quite markedly, but the latter more so. This can be expected, because in this case the tax increase not only affects the worker's decision on whether or not he or she will be absent, but also his or her decision on when to return to work.

Several robustness checks have been conducted, including separate analyses of specific illnesses, the application of different income thresholds to the sample of male workers, and separate analyses for selected industries and occupations. Qualitatively speaking, these analyses bring about minor changes. A variety of different net-of-tax measures were also tested, whereof only one has been reported here. These yield qualitatively similar, but slightly weaker results.

The results are surprising because they depict workers as very informed and rational individuals. It is perhaps fair to assume that many workers, possibly even the majority of them, have no idea about the kinks and twist of the tax system. However, workers on the margin – i.e., those who are affected by changes in the marginal tax rate – appear actually well-informed, and they adapt their sickness behaviour in ways that are quite rational. On the other hand, in the economic literature on labour supply, on active labour market policies, and on unemployment benefits, there is a long history of providing evidence of rational behaviour. So being surprised by informed and rational action is possibly unwarranted.

What can be learned from this study? Previous literature has focused on the impact that tax reforms have on earnings and labour supply, and produced mixed evidence on the importance of earnings taxes for the supply of labour. The results of the analysis here indicate that workers respond to these tax reforms also by becoming more absent from work. Therefore, the tax system that finances public sick pay is also paradoxically affecting the tendency for workers to be absent from work due to sickness, thereby directly influencing publicly and privately financed sick pay and indirect production costs. The study here shows that whenever politicians and public authorities consider increasing the marginal earnings tax to help cover the costs of public welfare expenditures, one can also expect to find an increase in public and private expenditure on welfare through increased sick pay. The considerable labour response indicates that a non-negligible cost is imposed on tax payers when raising an extra Norwegian krone.[17] Finally, it remains to be seen if the results hold true for countries other than Norway and for other time periods. Ljunge's (2010) study of Sweden indicates that this is indeed the case.

Appendix

[Table A1 around here]

Literature

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Table 1 Observed marginal tax rate period t-1 (t_{it-1}), the synthetic tax rates period t (τ_{it}) and absence days

Tax period t-1 (%):		7.8	29.1	29.4	29.6	35.8	49.3	55.3
A) Synthetic tax based on not-inflation adjusted income								
2001	$\tau_{it} - t_{it-1}$	-	-	-	6.2 [2990]	-7.6[11678]	-13.5 [45646]	-
2002	$\tau_{it} - t_{it-1}$	-	-	-	0.6 [27760]	-8.3 [4056]	-13.5 [7162]	-6.0 [3032]
2003	$\tau_{it} - t_{it-1}$	-	-	-0.3 [17182]	-	-7.3 [8107]	-13.5 [83069]	-6.0 [3553]
2004	$\tau_{it} - t_{it-1}$	-	-	-	-	-7.8 [4229]	-13.5 [20940]	-6.0 [2597]
Absence days		-		20.3	25.2	18.1	17.8	6.7
B) Synthetic tax based on inflation adjusted income								
2001	$\tau_{it} - t_{it-1}$	28.0 [91]	-	-	-	7.5[19252]	6.0 [4038]	-
2002	$\tau_{it} - t_{it-1}$	28.0 [886]	-	-	6.2 [7877]	11.9 [53514]	6.0 [4057]	-
2003	$\tau_{it} - t_{it-1}$	28.0 [684]	-	1.0 [17182]	-	13.4 [146783]	6.0 [8282]	-
2004	$\tau_{it} - t_{it-1}$	28.0 [789]	2.8 [73318]	-	-	13.5 [206794]	6.0 [11509]	-
Absence days		11.1	18.3	20.3	27.0	21.1	6.0	-

Note: Period: t=2001-2004. The table elements report the average tax rate change in percentage points for those experiencing changes and the corresponding average sickness absence days. Number of observations reported in brackets.

Table 2 The within-job transformed synthetic tax rates and absence days

	2001			2002			2003			3004		
	Neg.	Mean	Pos.	Neg.	Mean	Pos.	Neg.	Mean	Pos.	Neg.	Mean	Pos.
A) Synthetic tax rate period t (%)												
29.1	-	-	-	-	-	-	-3.43	-3.21	5.35	-3.56	-3.31	5.58
							(1.97)	(2.41)	(2.57)	(2.19)	(2.69)	(3.38)
							[15954]	[16355]	[401]	[11301]	[11620]	[319]
29.4	-	-	-	-4.64	-4.22	1.19	-	-	-	-	-	-
				(3.03)	(3.37)	(2.86)						
				[22624]	[24377]	[1753]						
29.6	-4.86	-4.12	0.67	-	-	-	-	-	-	-	-	-
	(3.11)	(3.53)	(1.99)									
	[15891]	[18322]	[2441]									
35.8	-6.04	-2.92	3.12	-5.67	-4.21	3.04	-5.40	-3.68	2.80	-5.34	-3.31	2.85
	(2.56)	(5.02)	(2.47)	(2.33)	(4.03)	(2.49)	(2.24)	(4.02)	(2.24)	(2.35)	(4.24)	(2.24)
	[36120]	[54787]	[18067]	[100903]	[121169]	[20266]	[96924]	[122600]	[25676]	[68373]	[91486]	[22749]
49.3	-2.57	6.37	6.96	-2.33	4.61	5.50	-2.14	4.63	5.31	-2.29	5.33	5.92
	(1.08)	(3.44)	(2.64)	(0.94)	(3.23)	(2.17)	(0.83)	(2.99)	(2.16)	(0.96)	(3.18)	(2.46)
	[6904]	[111895]	[104991]	[7275]	[64245]	[56970]	[6179]	[66885]	[60706]	[5292]	[74521]	[69229]
55.3	-	3.28	3.28	-	2.84	2.84	-	2.83	2.83	-	3.08	3.08
		(1.71)	(1.71)		(1.38)	(1.38)		(1.36)	(1.36)		(1.52)	(1.52)
		[4303]	[4303]		[5283	[5283]		[6399	[6399]		[5840	[5840]
B) Sickness absence days												
	-5.5	-5.1	-4.9	-0.2	0.6	1.7	1.9	2.2	2.5	1.8	2.2	2.6
	(27.5)	(33.5)	(35.9)	(33.5)	(34.1)	(34.9)	(35.7)	(35.2)	(34.6)	(38.9)	(35.6)	(32.5)

Note: The table reports the within-job transformed non-inflation adjusted synthetic tax rate (τ_{it} - $\bar{\tau}_i$) (Panel A) for those experiencing strictly positive or negative values (mean and separately, see column-sub-heading) and the within-job transformed average sickness absence days (s_{it} - $\bar{s}_i$) (Panel B). Standard deviations reported in parentheses. Number of observations reported in brackets.

Table 3 The impact of net-of-tax rate on the sickness absence for male workers.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Incidence rate (Conditional Logit)							
Log (1-τ)	-0.2917**	-0.3237**	-0.3342**	-0.1030**	-0.3291**	-0.3390**	-0.3227**
	(0.0341)	(0.0343)	(0.0316)	(0.0334)	(0.0341)	(0.0462)	(0.0465)
Sickness absence days (Conditional Poisson)							
Log (1-τ)	-0.4744**	-0.4851**	-0.4921**	-0.2982**	-0.4935**	-0.4363**	-0.4185**
	(0.0295)	(0.0296)	(0.0264)	(0.0300)	(0.0264)	(0.0362)	(0.0362)
Controls for:							
Fixed job effect, intercept, year, age(7)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Earnings previous period (9 dummies)	Yes	Yes	Yes	Yes	Yes		
Earnings current period (9 dummies)		Yes	Yes	Yes	Yes	Yes	Yes
Log workforce size, co-worker wage, regional V/U, wage growth rates (industry, educat.), absence rates similarly educated female workers			Yes	Yes			Yes
Log employment spell (days)	Offset	Offset	Offset	Offset	Yes	Offset	Offset
Earnings previous period (19 dummies)						Yes	Yes
Children, married(dummy), non-labour income (and squared), seniority (9 dummies)							Yes
Alternative tax measure				Yes			
Jobs/Observations	387137/1321685 (CLOGIT); 500723/1640711 (CPOISSON)						

Note: Population: All fulltime male workers between 20 and 60 years of age, earning at least 1G(see text). All models estimated as noted by Conditional Logistic regressions or Conditional Poisson regressions, where the regressions take into account fixed job effects. (1-τ) expresses the synthetic net-of-earnings tax rate, where the tax rate is determined by previous year's earning. Regional variation: defined on the municipality level. Industry-variation: defined on the 3-digit NACE-level. Educational qualification: defined by 1000 codes, differentiating between lengths and fields. Age: 7 dummies based on 5-years intervals. Earnings: dummies are based on the deciles or the 5-percentiles of the earnings distribution. Children: measured by the number of children below 7 years of age and the number of children below 18 years of age. Seniority: dummies are based on deciles of the seniority distribution. Full regression results are available from the author upon request. Bootstrapped standard errors based on 100 replications. ** and * denote 1 and 5 percent level of significance, respectively.

Table 4 The impact of net-of-tax rate on the sickness absence incidence rate and on the relative number of work days lost due to absenteeism. Specific illnesses

	Incidence			Sickness absence days		
	Muscular	Psycho.	Injury	Muscular	Psycho.	Injury
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Log (1-τ)	-0.285**	-0.6075**	-0.2414**	-0.4874**	-0.6635**	-0.3296**
	(0.0377)	(0.0737)	(0.0609)	(0.0397)	(0.0854)	(0.0937)
Regression method:	CL	CL	CL	CP	CP	CP
Jobs	248451	76125	112288	281770	81946	113718
Observations	849594	255115	381095	936751	268525	381910
Additional controls:	See model 3 in Table 3.					

Note: Regression method CL and CP denote Conditional Logistic and Condition Poisson, respectively, where the regressions take into account fixed job effects. See note to Table 3 for additional details.

Table 5 The impact of net-of-tax rate on the sickness absence incidence rate and on the relative number of work days lost due to absenteeism. Different earnings thresholds.

	Earnings thresholds					
	>1G	>2G	>3G	>4G	>5G	>6G
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Incidence (Conditional Logit)						
Log (1-τ)	-0.3342**	-0.3375**	-0.3474**	-0.3601**	-0.3370**	-0.3701**
	(0.0310)	(0.0345)	(0.0341)	(0.0334)	(0.0341)	(0.0480)
Jobs	387115	382415	373531	356934	293150	195381
Observations	1321593	1305643	1275299	1216447	986441	646276
Sickness absence days (Conditional Poisson)						
Log (1-τ)	-0.4921**	-0.4978**	-0.5328**	-0.5024**	-0.4346**	-0.4507**
	(0.0264)	(0.0314)	(0.0321)	(0.0334)	(0.0335)	(0.0535)
Jobs	500694	494888	482802	459608	369077	238402
Observations	1640600	1621712	1582483	1504413	1194180	760705

Additional controls:	See Model 3 in Table 3.

Note: See note in Table 3 for additional details. The population varies depending on earnings thresholds. Base population: All fulltime male workers between 20 and 60 years of age, earning at least 1G. G is the base term in the Norwegian public social services. From 2000 to 2004 the value of G increases from 48377 Nok to 58139 Nok. Publicly paid sick pay is capped at 6G, i. e., workers earning more than 6G will have to be privately insured to be fully compensated when absent due to sickness.

Table 6 The impact of net-of-tax rate on the sickness absence incidence rate and on the relative number of work days lost due to absenteeism. Industry-specific analyses.

.	All	Manufacturing	Construction	Trade	Education	Health and Social
Incidence (Conditional Logit)						
Log (1-τ)	-0.3342**	-0.3848**	-0.2837**	-0.2817**	-0.2077x	-0.5812**
	(0.0316)	(0.0703)	(0.0783)	(0.0780)	(0.1277)	(0.1324)
Jobs	387115	104490	48741	55723	23244	20117
Observations	1321593	368316	162764	190023	82171	65844
Sickness absence days (Conditional Poisson)						
Log (1-τ)	-0.4921**	-0.4978**	-0.4569**	-0.4671**	-0.6529**	-0.4748**
	(0.0264)	(0.0716)	(0.0766)	(0.0791)	(0.1466)	(0.1352)
Jobs	500694	136422	65674	71111	27265	28628
Observations	1640600	462860	208687	232284	93774	89140
Additional controls:	See Model 3 in Table 3					

Note: See note to Table 3 for additional details. [x] denotes 10 per cent level of significance.

Table 7 The impact of the net-of-tax rate on the sickness absence rates and how this differ for occupations having different unemployment rates. Occupation-specific analyses.

Occupations:	Natural science	Health and social care	Retail and sales	Construction	Industrial	Management
Unemployment rate (%): .	2.27	4.62	2.38	3.76	7.06	1.87

Incidence (Conditional Logit)						
Log (1-τ)	-0.3160**	-0.8903**	-0.1554	-0.1813x	-0.4767**	-0.1340
	(0.1195)	(0.1965)	(0.1529)	(0.1035)	(0.0915)	(0.1130)
Jobs	43069	12231	21558	34913	46245	47946
Observations	143897	40202	67283	117892	155951	166797
Sickness absence days (Conditional Poisson)						
Log (1-τ)	-0.4689**	-0.7406**	-0.3054*	-0.4151**	-0.6584**	-0.2082
	(0.1193)	(0.1762)	(0.1428)	(0.0849)	(0.0807)	(0.1295)
Jobs	49799	17016	29469	47497	63779	54497
Observations	162043	53706	86351	155376	204685	185134
Additional controls:	See Model 3 in Table 3.					

Note: See note to Table 3 for additional details. In addition, x denotes 10 per cent level of significance.

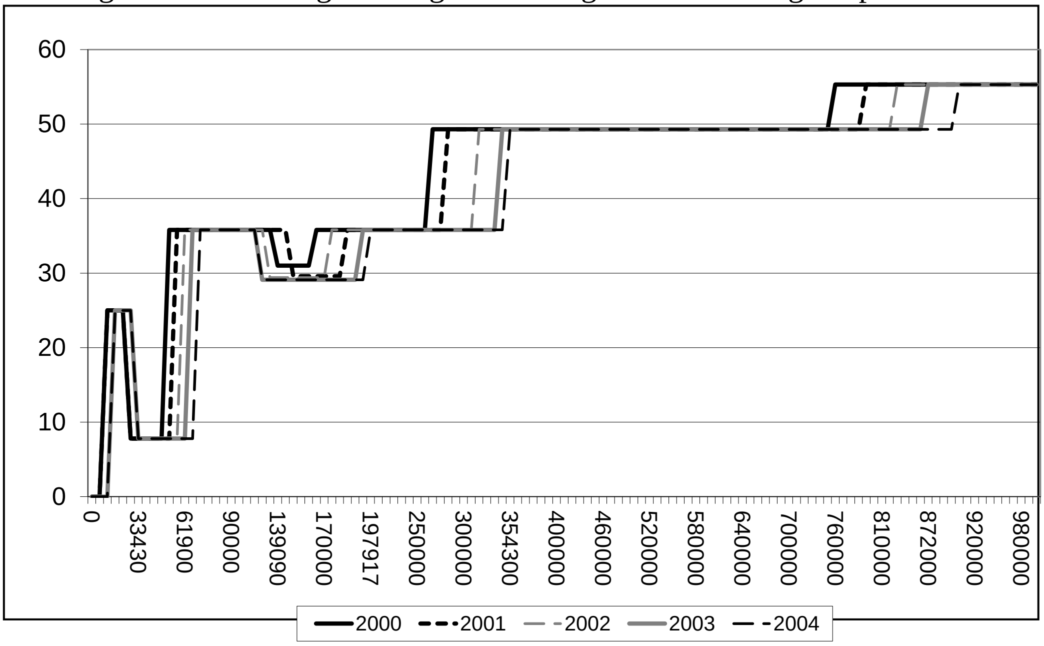
Table A1 Descriptive statistics

	All	2001	2002	2003	2004
	Mean (Std.Dev.)	Mean (Std.Dev.)	Mean (Std.Dev.)	Mean (Std.Dev.)	Mean (Std.Dev.)
Absent due to sickness (1=absent)	0.565	0.537	0.587	0.567	0.544
	(0.496)	(0.499)	(0.492)	(0.492)	(0.498)
Number of days absent due to sickness	27.638	23.433	29.107	29.852	28.344
	(58.153)	(51.004)	(59.888)	(60.888)	(60.184)
Log (1- τ)	-0.558	-0.574	-0.553	-0.551	-0.555
	(0.128)	(0.128)	(0.129)	(0.127)	(0.128)
Log workforce size	4.051	4.077	4.063	4.042	4.020
	(1.750)	(1.766)	(1.758)	(1.752)	(1.715)
Age	41.632	40.759	41.426	41.775	42.649
	(10.287)	(10.305)	(10.327)	(10.309)	(10.104)
Yearly earnings	364213	333600	362399	374099	387749
	(159320)	(148638)	(157442)	(159089)	(167413)

Average co-worker workplace earnings	375384	344230	375692	384899	397412
	(115427)	(107641)	(111048)	(115196)	(121623)
Regional vacancies per unemployed	0.940	0.162	0.093	0.061	0.061
	(0.087)	(0.126)	(0.071)	(0.040)	(0.039)
Industry wage growth rate	0.051	0.031	0.092	0.038	0.037
	(0.087)	(0.024)	(0.021)	(0.016)	(0.013)
Educational wage growth rate	0.050	0.031	0.095	0.036	0.036
	(0.034)	(0.028)	(0.020)	(0.016)	(0.017)
Absence days for equally-educated female	27.333	22.594	29.034	29.720	27.637
workers	(7.285)	(5.428)	(7.252)	(7.372)	(6.658)
Log employment spell (days)	5.872	5.885	5.865	5.867	5.872
	(0.120)	(0.073)	(0.135)	(0.130)	(0.129)
Observations	1640600	398478	439976	430885	371261

Note: The figures are based on the actual observations utilised in the Conditional Poisson regressions.

Figure 1 Changes in the Norwegian marginal earnings tax rate during the period 2000-2004.



Note: The x- and y-axis show nominal earnings (Nok, in 2009 1£=9Nok) and marginal earnings tax rate (in %), respectively.