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(POSTPRINT – final accepted version: RoMEO green/Green open access):

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The Scandinavian Journal of Economics

Vol. 117, no. 1, pp. 57 - 83 (2013) / DOI: 10.1111/sjoe.12082



# Imitation, Contagion, or Exertion?

## Using a Tax Reform to Reveal How Colleagues' Sick Leaves Influence

### Worker Behaviour

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June 2013

#### **Abstract**

We analyse social interaction effects in sick-leave behaviour at the workplace, using high-quality Norwegian matched employer-employee data with detailed individual information on sick leaves during the 2004 – 2006 period. The analysis finds that social interaction effects on sick leaves in the workplace do exist, and the effects are noticeable in size. The strong relationship between the sick leave rates among colleagues is not solely due to contagious diseases, nor is it caused by improved informational quality or by the increased workload for the non-absent workers. Evidence supports the existence of reciprocal worker behaviour that is unrelated to joint leisure-seeking activities.

**Index terms:** Sickness absence, social interaction, co-workers, panel data.

**JEL codes:** H55, J22, Z13

Acknowledgement: The authors thank the editor and the anonymous referee. Gratitude also goes to Per Johansson, Knut Røed, Wolter Hassink, Simen Markussen, Niels Westergaard-Nielsen, and Filip Pertold, as well as to the seminar participants at ESOP (Department of Economics, University of Oslo), the Department of Economics at the Aarhus School of Business, the Department of Economic History at Lund University, and the Institute for Social Research. The authors appreciate the fruitful discussions and helpful suggestions from the conference and workshop participants at the CAED-COST 2010 conference in London, the workshop on sickness absence and social insurance in Utrecht in 2011, and the EALE 2011 in Cyprus. This work was financed by the Norwegian Research Council under grants NO 187928/S20 and 199836/S20. Correspondence addresses: Harald Dale-Olsen, Institute for Social Research, P.O. Box 3233 Elisenberg, N-0208 Oslo, Norway, email: [hdo@socialresearch.no](mailto:hdo@socialresearch.no); Pål Schøne, Institute for Social Research, P.O. Box 3233 Elisenberg, N-0208 Oslo, Norway, email: [psc@socialresearch.no](mailto:psc@socialresearch.no). Kjersti Misje Østbakken, Institute for Social Research, P.O. Box 3233 Elisenberg, N-0208 Oslo, Norway, email: [k.m.ostbakken@socialresearch.no](mailto:k.m.ostbakken@socialresearch.no).

## 1. Introduction

Both the long-term development and the level of sick leave in redistributive Scandinavian countries such as Norway and Sweden have raised concerns in recent years, and these concerns have spurred the need to better understand the determinants of sick leave. The direct costs of absenteeism are very high.<sup>1</sup> Sick leave becomes even more costly if one accounts for indirect costs from production disruption. Under different welfare regimes, such as that in the US, the costs of sick workers showing up at work and underperforming, i.e. the cost of presenteeism, also raise concerns (Goetzel *et al.*, 2004; Hemp, 2004).<sup>2</sup> Social interaction at the workplace could be important for both absenteeism and presenteeism. This paper analyses social interaction effects in sick-leave behaviour at the workplace. In doing so we ask the following questions: Does one worker's sickness absence increase the propensity for similar absences among co-workers; i.e. is there evidence of group influence in sick-leave behaviour? If such evidence exists, can we reveal the behavioural mechanisms driving these social interaction effects?

The answers to these questions are important for several reasons. First, social interaction is important from a policy point of view. The presence of such behaviour indicates the potential for additional social gains, where a reduction in the absenteeism of one worker influences the behaviour of other workers. Such a social multiplier effect has been described theoretically (Lindbeck *et al.*, 1999) and identified empirically along a wide range of dimensions (Brock and Durlauf, 2001; Glaeser *et al.*, 2003). Factors influencing sick leave can thus be associated with a direct effect and an indirect effect, the latter operating through the influence that one individual's sick leave has on the behaviour of fellow workers.

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<sup>1</sup> According to Norway's National Budget 2010, publicly-paid sick pay constitutes 1.5 per cent of GDP (37.5 billion NOK) ([http://www.statsbudsjettet.dep.no/upload/Statsbudsjett\\_2010/dokumenter/pdf/summary\\_national%20budget\\_2010.pdf](http://www.statsbudsjettet.dep.no/upload/Statsbudsjett_2010/dokumenter/pdf/summary_national%20budget_2010.pdf)). Privately-paid sick pay is not included in this figure.

<sup>2</sup> Business webpages such as <http://www.businessknowhow.com/manage/presenteeism.htm> argue that the costs of presenteeism outweigh the costs of absenteeism.

Second, statistics show that a sizeable share of individuals on disability pension have a prior history of sick leaves (Fevang and Røed, 2006), suggesting that understanding the mechanisms by which social interaction influences sick leave is important for reducing the stream of individuals into dependence on the welfare system (as implicated by Elster, 1989a; Lindbeck and Nyberg; 2003; and Lindbeck *et al.*, 2010). Empirically speaking, we know that social interaction effects exist in relation to welfare dependency (Åslund and Fredriksson, 2009; Markussen and Røed, 2012), particularly in connection to neighbourhood effects (Topa, 2001; Rege *et al.*, 2012).

Finally, the introduction of new work practices is one characteristic of “the new economy”, which has emerged in advanced industrialised countries during recent decades. Such changes comprise a move away from traditional assembly line organisational structures towards multi-tasking, job rotation, teamwork, reductions in management levels, and decentralised responsibility (Lindbeck and Snower, 2000). When compared to traditional assembly line production, these “new” practices require interpersonal communication and social interaction to a much greater extent. At a time when the level and intensity of social interaction are increasing in the workplace, it should be of great importance to analyse the role that such mechanisms might play in absence behaviour.

We contribute in several ways to a growing but still scant empirical literature that focuses on how social interaction effects sick leave in the workplace (Ichino and Maggi, 2000; Hesselius *et al.*, 2009; Lindbeck *et al.*, 2009). First, we exploit very rich, longitudinal population-wide employer–employee register data comprising physician-certified information (diagnoses) regarding the illnesses that cause sick leaves. Much of the previous research has been conducted on single firms or on firms within a limited regional area, which restricts the general applicability of the results. Thus, a representative study drawing on the whole labour market is timely. The longitudinal features of the data will also enable us to estimate fixed-effect models, taking account of time-invariant unobserved effects related to individuals and jobs. Second, we address

the severe identification problem associated with the estimation of social interaction effects by employing an instrumental variable approach. Our identification strategy is based on Norway's 2006 tax reform, which had various effects on labour conditions because of wage heterogeneity and tax bracket effects. Due to the fixed-effect approach, we are able to measure social interaction along the internal margin (when no change occurs in peer group composition).

The adopted approach allows us to disentangle the different reasons for why a positive correlation between the behaviour of the individual and the behaviour of their co-workers may exist. Manski (1993) distinguishes between three types of mechanisms: i) endogenous social interaction effects, arising from the mechanism by which the behaviour of individuals in the group directly affects the behaviour of an individual member of the group; ii) contextual interactions, where the behaviour of a person varies in some way with exogenous characteristics of the group members; and iii) correlated effects, where individuals in the same group tend to behave similarly because they have similar individual characteristics or face similar institutional environments. Our research uncovers evidence for the first of these mechanisms.

The paper proceeds as follows. Section 2 gives a brief presentation of the related literature, while Section 3 describes the Norwegian sickness benefit system. Section 4 presents the 2006 Norwegian tax reform and discusses why this reform might influence sick-leave behaviour of workers. Section 5 presents the data, the sample, and the variables, while Section 6 presents the econometric specifications. The main results are presented in Section 7 before the discussion and conclusion are taken up in Section 8.

## **2. Empirical research on absenteeism and social interaction**

In the social psychology and management literature, the importance of social influence and norms for absenteeism have been analysed at least since Chadwick-Jones *et al.* (1982) documented the large variance in absence across industries, organisations, and intra-organisational units. These

small-scale analyses typically reveal that individuals' absence decisions are strongly influenced by the organisation's or the unit's "absence culture" (Harrison *et al.*, 2000).

Our paper relates directly to the economic literature that focuses on social interaction effects related to sick leaves. While growing, this literature is still rather scarce. Hesselius *et al.* (2009) use Swedish data to analyse how co-workers affect each other's propensity to be absent from work. They exploit a large-scale, randomised social experiment that altered the short-term sick-leave incentives for half of all employees living in Gothenburg, Sweden. Their results show that in workplaces where a high proportion workers are absent, individual co-workers increase their own absence levels significantly, suggesting that social interactions are an important determinant of work absence. They conclude that their results support the reciprocal behaviour of workers.

In another study Ichino and Maggi (2000) analyse shirking behaviour within a large Italian bank. They find that the prevalence of shirking within the bank is characterised by significant regional differentials. Episodes of absenteeism and misconduct are substantially more prevalent in the south than in the north. A number of potential explanations are put forward for this fact: different individual backgrounds; group-interaction effects; sorting of workers across regions; differences in local attributes; different hiring policies; and discrimination against southern workers. The latter two explanations are discarded, and the individual's background appears to be the most important contributor.

Gellatly and Luchak (1998) analyse social interaction within a firm – a complex hospital setting in Canada – albeit in a more qualitative way. Their results suggest that the employees' normative perceptions were influenced both by their prior personal absence and by the average level of absence within their immediate work group.

Finally, Lindbeck *et al.* (2009) use Swedish data and ask whether the average level of sickness absence in a neighbourhood affects individual sickness absence through social interactions at the neighbourhood level. Their research yields statistically significant estimates that

indicate the crucial role of group effects. Their IV point estimates lie in the range of 0.63 to 0.67, implying that a person who lives in a neighbourhood with an average that is one day higher than in another neighbourhood will take approximately 0.63 to 0.67 more sick days.

### **3. The Norwegian public sickness benefit system**

In an international context the Norwegian public sickness benefit system is generous (OECD, 2009). If one is employed and has been so for at least four weeks, one is entitled to sick pay from the first day of sickness. The entitlement is limited to a maximum of one year. The sickness benefit is “fully” wage compensated, i.e. for most workers the benefit level is set to 100 per cent of their fixed pay.<sup>3</sup> Sick pay is disbursed by the employer for the first 16 days, after which sick pay is publicly disbursed and administered by the Norwegian labour and welfare administration (NAV). Spells of sickness of up to three days are based on self-certification by the worker. Sick leave lasting longer than three days requires certification by a physician.<sup>4</sup> However, as in the other Scandinavian countries, Norwegian physicians seldom deny sickness certificates (Englund, Tibblin and Svardsudd, 2000; Wahlström and Alexanderson, 2004; Carlsen and Nyborg, 2009), thus leaving considerable scope for social interaction and thereby affecting both self-declared and physician-certified sickness absences. Workers that are not able to return to work after one year of sickness absence are offered rehabilitation and benefits to qualify for other types of jobs. Disability benefits are offered where returning to work is not possible.

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<sup>3</sup> Private sector workers with labour income that exceeds six times the basic minimum entitlement requirements in the welfare system are not entitled to public sickness benefit for income above the threshold, although the majority of employers offer top-up compensation for high income workers. By May 2009, the threshold equalled 437,286 NOK, or approximately 52,000 Euro.

<sup>4</sup> If the workplace is part of the Integrated Working Life (IW) treaty, the workers are entitled to eight days of sick leave without physician’s certification. The IW treaty covers approximately half of the labour force. Employers are entitled to allow longer absence periods than three days without being certified by a physician.

#### **4. The Norwegian tax reform of 2006 and the relationship between marginal income taxes and sick leave**

The tax reform was implemented for redistributive reasons (Thoresen *et al.*, 2011; Thoresen *et al.*, 2012). It introduced reduced marginal income tax for higher income levels, while adjusting the deductible elements for taxable income at the bottom. At the same time, it introduced a tax of 28 per cent on dividend payments in excess of an ordinary return on assets. The total redistributive impact of the reform has been analysed by Thoresen *et al.* (2011, 2012), who conclude that the impact has been relatively minor but that both the redistributive effects of the tax system as well as the degree of horizontal equality have improved slightly. Wage earners' response to this tax reform also appears to be modest (Thoresen *et al.*, 2011).

[ Figure 1 around here]

Figure 1 shows that the 2006 tax reform excluded the northernmost municipalities (they experience slightly altered tax rates). The figure reveals three characteristics of the Norwegian income tax schedule and the reform. First, marginal tax varies quite dramatically across the income distribution. Even if the number of male workers earning less than 100,000 NOK is very small (most male workers work full time), only minor differences in income above 100,000 NOK might induce severe changes in marginal tax. Second, in 2006 the marginal tax schedule changed markedly due to changed marginal taxes within brackets that primarily affected the upper half of the income distribution. Third, moving tax brackets from 2005 to 2006 also influenced the marginal tax schedule. These kinds of changes induced variation in marginal taxes in a way that affected workers' sick-leave behaviour, which we can exploit in our analyses of peer effects.

Why do we expect such tax changes to affect sick-leave behaviour? A huge number of studies have focused on earnings and labour supply responses following tax reforms (for example, Blundell *et al.* (1998) and Gruber and Saez (2002); see Saez *et al.* (2012) for an overview). However, direct evidence is more limited regarding how taxes affect sickness absence behaviour.

Johansson and Palme (2002) utilise joint changes in sick-pay cuts and the Swedish tax system (which provides variation in the price of leisure) to show that absenteeism drops as the cost of absenteeism increases for workers. Ljunge (2010) identifies a substantial elasticity of sick leave among a 3 per cent sample of the Swedish population from 1974 to 1990, with sick leave varying by -0.7 with respect to the net-of-tax rate. Motivated by a classical efficiency model (Barmby *et al.*, 1994), Dale-Olsen (2013) identifies similar negative elasticities of -0.3 to -0.6 with respect to the net-of-tax rate for all prime-age male workers in Norway between 2001 and 2004, even when accounting for fixed job effects and for different industries, occupations, and income brackets. Thus, the empirical evidence strongly indicates that the higher the marginal labour-related income tax a worker faces, the more likely he is to become absent and the longer he stays absent.

Therefore, since changes in the marginal taxes affect the sick-leave behaviour of workers, and the 2006 tax reform clearly altered the Norwegian tax schedule, we argue that this will provide us with the necessary exogenous variation in peers' sick leave when we analyse how workers are affected by this behaviour (this is discussed in more detail in Section 6).

## **5. Data and variables**

Our starting point is a public administrative register containing information on all registered jobs in Norway, with information on duration of employment, wages, and working hours. This register is linked with other public administrative registers in an integrated data system, all managed by Statistics Norway.

The analyses are based on matched employer–employee register data for the 2004–2006 period, with unique identifiers that link individuals to plants (2004 data is only used for constructing a synthetic tax rate; see section 5.3). The panel dimension enables us to follow these individuals over time, and thereby estimate fixed-effect models. Data comprise information on all registered male workers in the Norwegian labour market. Since we are utilising the 2006 tax reform when analysing peer behaviour, our analysis will be limited to changes in peer behaviour

with the same employer during the 2005 – 2006 period. However, this has the benefit of making a worker’s network or peer group uniquely identifiable.

### *5.1 The peer group*

The main focus in our study is on social interaction effects, and thus a crucial dimension is related to the construction of peer groups. We define a male worker’s peer group as male colleagues who are employed in the same workplace within the same seven-digit occupation.<sup>5</sup> By choosing this approach for defining peer groups, in some cases we miss the relevant peer groups. Bamberger and Biron (2007) argue that the referent groups are often nested within formal organisational units in loosely defined teams. Fehr and Schmidt conclude that identifying “the relevant reference agents” is an important yet unresolved problem (2006: 655). In an ideal world data would comprise information identifying the relevant referent others, but population-wide register data seldom or possibly never includes this. One possible consequence of this misclassification could be that we underestimate the peer effects. For example, Halliday and Kwak (2012) found that the positive peer effects associated with school performance, smoking, sexual behaviour, and drinking were smaller when these effects were estimated based on peer groups comprising classmates compared with peer groups based on friends.

All individual-level variables are also measured for the peer groups, i.e. for each individual we calculate the peer group average (excluding the individual’s values) of all the individual-level variables. Our estimate of the peer effect will be identified from the relationship between the average number of sick days of the peer group and the number of sick days of the individual worker. Since Fehr and Schmidt (2006) point out that the average player is not necessarily the empirically relevant agent, this might induce measurement errors affecting our sick-leave measure.

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<sup>5</sup> Women in the workplace are not included, either as individual workers or as peers, since their sick-leave behaviour is very different to men’s due to fertility- and childcare-related absences.

### *5.2 Measuring the marginal net-of-tax rate*

In our analyses we will focus on the marginal net-of-tax rate, i.e.  $(1-t)$ . We measure the net-of-tax rate in two ways. First, we measure it as the realised net-of-tax rate. Second, we let the rate for year  $t$  be expressed by a synthetic net-of-tax rate for each worker,  $(1-\tau_{ijt})$ , based on the income level of the previous period  $t-1$  adjusted for expected inflation, i.e.  $1-\tau_{ijt}=1-f((1+g)I_{it-1})$ , where  $I$  denotes income in period  $t-1$  across all jobs and  $g$  denotes expected inflation as expressed by the growth in the baseline social service figure  $G$  (the level of  $G$  is publicly available within the new tax schedule). By calculating net-of-tax rates based on the tax legislation for period  $t$  but using the labour-related income from the previous period  $t-1$ , we will also avoid potential problems related to reversed causality (between income and marginal taxes).

### *5.3 The sick leave measure*

Our dependent variable is the physician-certified number of sick days within a year, as registered in NAV's register database of sickness absences. The scope for peer effects associated with sick-leave duration is greater than for number of spells, since the duration of a sick leave is influenced by the decision to become absent and then by the decision to return to work. It is easy to imagine cases where a worker is not able to influence his or her illness. In practice NAV's database covers all sick-leave spells that last longer than three days (registered from the first day).<sup>6</sup> The data set also contains individual information on diagnosis (ICPC-2 classification). Based on this information, we distinguish between four diagnosis groups: i) contagious diseases; ii) musculoskeletal complaints; iii) fractures, sprains, and dislocations; and iv) acute stress reactions. In the Appendix Table A2 these groups and the ICD-10 codes that constitute them are described in more detail.

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<sup>6</sup> Only the start and end date of a sick-leave spell are known. In the few cases where sick-leave spells overlap, we have merged these into one spell with the start date of the first spell and the end date of the last spell.

#### *5.4 Main control variables*

Individual explanatory variables include information on age, seniority, working time, marital status, number of children below 7 years and below 18 years of age, log hourly wages in a job, and the net-of-tax rate (see section 5.2 above). Age is measured by eight dummy variables, each covering a five-year span. Seniority is measured by the number of years employed by the present employer. Working time is measured by log weekly working hours, while marital status is measured by a dummy variable representing whether the person is married or not. The hourly wage is measured by the total weekly labour market earnings in a job (including taxable fringe benefits) divided by the number of weekly working hours. Since we endorse a fixed worker-effect approach, focusing on workers who remain in the same job accounts for all fixed job variations.

Except for log number of peers, the peer-level variables are constructed as averages of the individual variables, as noted in 5.1. Workplace-level variables include log number of employees and number of sick days among non-peer colleagues. Industry and regional shocks are accounted for by the log employment in the workplace's industry (three-digit NACE) and the local vacancy/unemployment rate (measured at the municipality level).

#### *5.5 The final sample*

When all variables are constructed and measured (for peer-, regional-, and industrial-level variables), we discard information on i) workers with peer groups of fewer than two other colleagues and ii) workers receiving income less than the baseline figure from social services (G, equals 66,000 NOK in 2005). First, the peer group needs to reach a certain size to be credible and to avoid integer problems.<sup>7</sup> Second, for the very few low-income men (less than three thousand working only a few hours, the registered sick days should at least be adjusted to take into account

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<sup>7</sup> Random but small variations over time in sick-leave days affect peer averages disproportionately stronger when a peer group comprises only one or two workers.

the lower risk period. One could also argue that analyses of sick-leave hours would be more relevant for this group of workers.

We follow the remaining workers and peer groups from 2005 to 2006. This sample comprises close to 400,000 male workers and 47,790 peer groups. Seventy-nine per cent of the peer groups experienced tax changes, i.e. they contained at least one worker affected by the tax reform. The 2006 tax reform was quite comprehensive, with the consequence that although unaffected peer groups exist, the average percentage of affected peers across peer groups was over 40 per cent. Table A1 in the Appendix presents descriptive statistics on the key variables.

## 6. Econometric specification

The aim of our analyses is to examine whether individual sick-leave behaviour is affected by peer group behaviour. Basically, we want to estimate the following relation:

$$(1) S_{ijt} = \alpha_1 + \alpha_2 \bar{S}_{jt} + \alpha_3 X_{ijt} + \alpha_4 \bar{X}_{jt} + \alpha_5 (1 - t_{it}) + Y2006 + \theta_i + \varepsilon_{ijt}, t = 2005, 2006$$

where  $S_{ijt}$  is sickness absence for individual  $i$  from group  $j$  at time  $t$ , while  $X_{ijt}$  is a vector of three types of explanatory variables: i) individual characteristics; ii) characteristics of the individual's workplace; and iii) characteristics of the region where the workplace is located.  $(1 - t_{it})$  expresses the net-of-tax rate.<sup>8</sup>  $\bar{X}_{jt}$  is a vector with characteristics of the individual's peers, and  $\bar{S}_{jt}$  is a measure of the average sick leaves of  $i$ 's peers.  $Y2006$  expresses a time fixed effect,  $\theta_i$  is a time-invariant individual effect, and  $\varepsilon_{ijt}$  is an error term. The main coefficient of interest is  $\alpha_2$ . This measures the relationship between the mean sick-leave rate of the co-workers and the individual worker's sick leave.

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<sup>8</sup> The net-of-tax rate could be measured by the realised net-of-tax rate, by a synthetic net-of-tax rate for each worker, or by the relationship between the sick-leave days and the net-of-tax rate modelled by an IV approach, where a dummy for effects of the tax reform would act as an instrument for the net-of-tax rate.

For three reasons, estimating peer effects on sickness absence from (1) based on OLS yields biased estimates. First, as a consequence of the reflection problem presented in Manski (2000), estimation by OLS will not let us disentangle the peer group effect from the effect that workers with similar unobserved characteristics group together at the same workplace, and the effects from being exposed to the same local or regional impacts (contextual variables). Second, a worker might also influence his or her peers, causing a reversed causality problem. Third, we cannot exclude the presence of non-classical measurement errors. Self-certified sick leaves for peers are not observed in our data (see note 5), and such measurement errors associated with  $\bar{S}_{jt}$  might cause problems (the similar error associated with the endogenous variable in left-hand side of equation (1) is of course ignorable). Unfortunately, these three reasons also imply an a priori ambiguous bias.

To allow causal statements on the relationship between individual and group sick-leave behaviour, we therefore use a 2SLS procedure that exploits the way in which the 2006 tax reform affects the sick-leave behaviour of the peer group. We argue that this tax reform was exogenous for each worker and each peer. Determined by the Ministry of Finance, the new tax schedule was made public at the end of 2005. Thus, when the reform became publicly available the workers already knew their current income, and they could utilise this knowledge in determining the level of marginal taxes they would face in 2006.

The average tax change for the peer group is calculated simply by taking the average of the peers' individual tax changes. By exploiting how the tax reform induces labour supply changes, we are able to analyse how a worker's absence behaviour is affected by purely tax-driven absence responses among his peers. Therefore, our identification rests only on variation over time in the tax schedule. We exploit variation in the marginal tax rate caused by changed tax rates within brackets, but also variation caused by "bracket creep" (Saez, 2003) (which induces discontinuity effects).

For a worker and his peers receiving identical pay, such changes induce the same labour supply responses. However, most co-workers do not receive identical pay, and thus miniscule labour-related income differentials will induce quite different labour supply responses related to tax reforms. This also implies that tax rate changes following a tax reform that affects a worker's peers might be used as instruments for the sick-leave behaviour of peers, in a sick-leave regression conditioned by controls for how the tax reforms affect the worker. These tax changes suffer from neither the same measurement problems as peers' sick leaves nor the reversed causality problem. As described in section 5.3, we measure changes in marginal taxes as the realised changes in the net-of-tax rates or by the changes in the synthetic net-of-tax rate.

However, albeit such tax policy changes are exogenous for each worker, the change in the tax schedule can econometrically only be considered weakly exogenous (see the discussion in Cameron and Trivedi, 2005: 908).<sup>9</sup> Thus, to account for both fixed effects and weakly exogenous instruments, we are forced to estimate equation (1) by 2SLS using first-differenced data, i.e. we estimate the following relation:

$$(2) \quad S_{ij2006} - S_{ij2005} = \alpha_2(\bar{S}_{j2006} - \bar{S}_{j2005}) + \alpha_3(X_{ij2006} - X_{ij2005}) + \alpha_4(\bar{X}_{j2006} - \bar{X}_{j2005}) + \alpha_5((1 - \tau_{ij2006}) - (1 - \tau_{ij2005})) \\ + \alpha_6(\ln w_{ij2006} - \ln w_{ij2005}) + \alpha_7(\overline{\ln w}_{j2006} - \overline{\ln w}_{j2005}) + \varepsilon_{ij2006} - \varepsilon_{ij2005}$$

where the notation is as previously defined and where  $(1 - \tau_{ijt})$  and  $\ln w$  denote the synthetic net-of-tax rate and log daily earnings (in Equation 1)  $\ln w$  was incorporated in the  $X$ - and  $\bar{X}$ -vectors).  $\bar{S}_{jt}$  is our measure of the average number of sick days of worker  $i$ 's peers, instrumented by  $\overline{(1 - \tau_{jt})}$ .<sup>10</sup>

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<sup>9</sup> The reason why the change in the tax schedule is not strongly exogenous is that a worker's sick-leave behaviour might influence his peers' future sick leaves, and thereby influence his peers' income and marginal tax rates in the future, otherwise such changes would have been strongly exogenous.

<sup>10</sup> We have also estimated equation (2) by incorporating a worker's observed net-of-tax rate as an additional endogenous variable on the right-hand side, together with the peers' average sick-leave days, and instrumented these

Identification rests on three assumptions. First,  $\overline{(1 - \tau_{jt})}$  is assumed to be weakly exogenous, i.e.  $E[\overline{(1 - \tau_{jt})}(\epsilon_{ijt} - \epsilon_{ijt-1})] = 0$ . Second, peers' incomes from sources other than the employment relationships defining them as peers are uncorrelated with a worker's sick-leave behaviour, conditional on the very detailed control vector. Third, a worker's sick leaves this year do not influence the peers' incomes until the subsequent year. This latter assumption is not unrealistic since sick leaves are close to fully compensated and since performance bonuses in the private sector are usually paid after the end of the financial year (fourth quarter results are usually ready during the spring of the subsequent year).

## 7. Main results

### 7.1 Background

As an empirical background we look closer at the net-of-tax changes for the individual workers (in Panel A) and for the peer groups (in Panel B), shown in Table 1. For the peer groups, we also present statistics for different sectors and different workplace groups. The table comprises information for all workers (first column) and separately across workers in each of the different tax brackets defined by the synthetic tax rate of 2005.

[ Table 1 around here]

The reduction of the top tax is clearly visible as the net-of-tax increases, but we see that the majority of the workers who were originally taxed at 35.8 per cent end up experiencing a reduction of the net-of-tax rate. Conditional on income level in 2005, the changed tax schedule implied a weak net-of-tax increase on average across all workers. The pattern for the synthetic rate mimics the realised rate, except that for the least taxed, the average synthetic net-of-tax rate growth becomes positive on average. For the peer groups, we see that workers facing top taxes in

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using the synthetic net-of-tax rate of the worker and the corresponding average figure for his peers. This complicates the estimations, but yields qualitatively the same results as the approach we have chosen to present.

2005 have peers experiencing stronger net-of-tax increases than other workers, while workers facing low taxes have peers experiencing small net-of-tax reductions on average. The pattern across tax groups for each of the different sub-groups is quite similar to the overall pattern.

What then is the relationship between these tax changes and the development in the number of sick days from 2005 to 2006? The upper section of Figure 2 shows the relationship between average change in the net-of-tax rate from 2005 to 2006 for an individual worker, and the corresponding changes in the number of sick days. As with the findings reported by Ljunge (2010) and Dale-Olsen (2013) in other countries and for other time periods, this picture reveals a negative relationship between net-of-tax changes and sick days. The lower section of Figure 2 reveals a similar relationship for the average peer values, where once again we observe a negative relationship between changes in peers' net-of-tax rate and changes in peers' number of sick days (this is a strongly significant linear relationship).

[ Figure2 around here]

### *7.2 Peer effects related to sick leave in general*

As pointed out in Section 6, a prerequisite of our empirical strategy is that the 2006 tax reform affects the sick-leave behaviour of individual workers, although this is not the main focus of our article. We establish this relationship in Appendix Table A3, where we present the results from several linear regressions on the relationship between the number of sick days and the net-of-tax rate and from different controls on first-differenced observations. The first-differencing takes care of individual fixed effects (and in this case, also of fixed job effects due to the balanced nature of the data). These regressions confirm what has already been shown by Ljunge (2010) and Dale-Olsen (2013), i.e. that when the net-of-tax rate increases, an individual tends to take a shorter sick leave. It is also evident that this relationship is quite robust in terms of the modelling approach.

For simplicity, therefore, subsequent analyses of peer effects continue to utilise the synthetic net-of-tax rate for the individual as a control variable, while we model sick-leave behaviour of the peers as an endogenous variable.

We start our main analyses by taking a closer look at how a worker's sick-day numbers correlate with his peer group's average number of sick days, conditional on a parsimonious control vector. The results from these regressions are presented in the first model in Table 2.

[ Table 2 around here]

In Model 1 we estimate on first-differenced observations a simple regression of sick-day numbers on peers' average number of sick days and a set of basic controls. As seen in Model 1, we find a modest but statistically strong, positive correlation, implying that for each day the peer group's average sick leave increases, an individual worker extends his sick leave by 0.041 days.

Then, in Model 2, we solve the problem of endogeneity and measurement errors affecting the peer group's average number of sick days, which arose in the previous model. Thus, we identify a causal impact of 0.316 for the effect of peer group's sick-day numbers on an individual's sick-day numbers. As seen in the bottom half of Table 3, changes in a peer group's average net-of-tax rate are, as expected and as shown in Figure 2, negatively related to changes in the peer group's average number of sick days, and this instrument is thus clearly strong.

Models 3 and 4 are identical to Models 1 and 2, except that we add more detailed controls for income in the form of nine dummies for the income deciles (and peer averages of these). Finally, in Models 5 and 6 we add controls for the average number of sick days of non-peers, a dummy for the worker being involved in other industrial activities, the number of small children, the number of children younger than 18 years, a dummy for being married, and the peer averages of the same variables. Our control variables thus capture the impact of workplace, industry, and regional shocks affecting the sickness-absence behaviour of workers, and the direct impact of the tax reform for the individual worker is also taken into account. In the latter two models we also account for work environment and bad management (which are assumed to affect non-peer

colleagues similarly and therefore will be captured by the sick-leave behaviour of non-peer colleagues).

In all the regressions the peer effect remains strongly significant and positive, and in the most involved non-IV model it increases to 0.04. However, the importance of the peer effect increases dramatically when we apply our two-step IV approach. This implies that the non-IV figures were biased towards zero. Conditional on fixed worker effects, our IV figures suggest that whenever the peer group's average number of sick days increases by one day, a worker's sick leave is extended by 0.3 to 0.4 days. The peer effect indicated by these estimates is thus quite strong.

In the next sub-sections we conduct several robustness checks and test alternative explanations for these peer effects. Except where noted, all these regressions, as presented in Tables 3 and 4, are equal to that of Model 6 in Table 2 (i.e. our preferred model).

## *7.2 Robustness checks*

### Pseudo-peers

Our first test of whether the peer effect is really related to social interaction is to create pseudo-peers, i.e. by drawing random samples of peer groups belonging to similar occupations but from different workplaces than the original. Thus, if our results are strongly related to occupational or educational characteristics but not related to social interaction, our previous results will be largely unchanged. If social interaction is a major force behind our previous results, the analyses based on pseudo-peers will not identify significant peer effects. The result from this regression is presented in Model 1 of Table 3. We find no evidence of any significant interaction effects. When we compare workers and randomly-selected peers from similar occupations, we find no interaction effects – a result which is in accordance with the notion that our main results are driven by the social interaction between co-workers.

### Work-related incidences affecting sick leaves and marginal taxes jointly

Next, we explore the notion that certain work-related incidents could affect workers' sick leaves and their marginal tax jointly. To a certain extent this issue was addressed in Model 6 in Table 2 by controlling for sick-leave behaviour among non-peer colleagues, since work environment and bad management could be assumed to affect peers and non-peer colleagues similarly. To strengthen the robustness of our conclusions even further, in this sub-section we explicitly study work-related phenomena that are known to affect sick leaves and marginal taxes: downsizing and upsizing and local labour market tightness. To control for the influence of downsizing and upsizing, we focus on relatively stable workplaces experiencing less than +/- 5 per cent employment growth. We then repeat the analysis on this restricted sample. As seen in Model 2 in Table 3, our peer effect does not diminish and remains statistically strong, and the point estimate even increases compared with our baseline figure from Model 6 in Table 2. Thus, upsizing or downsizing is not why we observe peer effects.

In Models 3 and 4 we similarly estimate our baseline model on a sample split according to whether the workers live in municipalities experiencing high or low vacancies or unemployment growth (above or below a growth rate of 0.2 per cent). The peer effects remain strong in both cases, but statistically they are similar (there is a slightly higher estimate when local labour markets improve).

### Long-spells

If our peer effects were caused by really long absence spells, it would be hard to argue that they reflected nothing more than social interaction at work. Thus, we discard from the data all observations of workers experiencing at least three months of sick leave, and we repeat our regression on this sample. As is evident in Model 5 in Table 3, the results somewhat reinforce the peer effect compared to our baseline result from Model 6 in Table 2, but this difference is not

significant. Thus, the peer effect shows up in relatively short spells as well and is at least not explained by sick leaves of very long duration.

### *7.3 Alternative explanations*

#### Strenuous work, extra work load and stress following peers' absence

Do the effects follow from the extra workload and stress that non-absent co-workers take on when peers are on sick leave? This additional strain may already induce extra sick days during the first year of absence. This is a difficult question to answer empirically, since the classical illnesses related to heavy and strenuous work are also illnesses that are more subjective. Consider certain musculoskeletal diseases, for example. Sick leaves resulting from musculoskeletal issues, such as back pain, may clearly follow from repetitive and physically strenuous work (such as heavy lifting). Therefore, if increased sick leaves among peers means that extra work has to be done by the non-absent workers, there will be a positive relationship between a worker's sick leave and his peers' sick leave. However, the causes of back pain can also be hard to diagnose from physical symptoms, which means that such absences are more at the discretion of the worker than absences due to serious injuries and other illnesses.

Our strategy in this sub-section is three-fold. First, we study sick days related to musculoskeletal complaints, i.e. diagnoses where repetitive and physically strenuous work is an antecedent, although this comprises a subjective element since physical evidence for these ailments might be missing. Second, we study sick days related to what we classify as objective musculoskeletal injuries, such as fractures, sprains, and dislocations. We argue that if the social interaction effect results from non-absent workers assuming additional workloads when co-workers are on sick leave, then the effect should be visible not only for musculoskeletal complaints but also for fractures, sprains, and dislocations as well. The findings from these regressions are presented as Models 1 and 2 in Table 4.

Our analyses reveal that the peer effect is not important for the number of sick days related to either musculoskeletal complaints or to fractures, sprains, and dislocations. However, the work shifted onto non-absent workers might induce stress and psychological strain instead of physical strain (which may induce later musculoskeletal disorders). Therefore, the third step is to focus on sick leaves related to acute stress reactions. The peer group's average number of sick days is still based on all kinds of diseases. We see in Model 3 that higher levels of average sick days among peer groups do not significantly extend the sick leave of an individual worker related to stress. The point estimate is positive, but the impact is much too small to explain our main impact when we study all kinds of sick leaves. Thus, acute stress is not the reason why workers respond to peers' sick leaves. Therefore, our conclusion to this sub-section is that strenuous work, extra workload, and stress following peers' absences, are not the reasons for the observed peer effects.

#### Contagious diseases

An obvious question pertaining to our results is whether they are related to or are the result of contagious diseases. Our next test addresses this question. We identify sick leaves related to contagious diseases (ending in a physician-certified sick leave) (see appendix for the definition of contagious diseases), and we employ this as our endogenous variable. We then study whether a worker's sick leave due to contagious diseases responds to the peer-group average sick-day numbers conditioned by our controls. The important result arising from Model 4 in Table 4 is that there is no causal relationship between a worker's sick days due to contagious diseases and his peers' average number of sick days. Therefore, contagious diseases are not the reason why we observe peer group effects.

### Sick leaves, individual costs, informational quality and leisure complementarity among peers

From an altruistic viewpoint the peer effects may be explained by workers being absent when peers are also absent due to joint leisure activities (as suggested by Rotemberg, 1994). Peer effects can also be related to changed information quality. We apply a tax reform to identify the peer effects, but when viewed in isolation, such a reform neither changes workers' awareness of the social insurance system nor increases their demand for joint leisure time. However, it affects peers' sick leaves, and this change in behaviour is observed by a worker. Increased sick-leave levels among peers might thus improve awareness of the social insurance system. Similarly, the knowledge that his colleagues are on leave might influence a worker's demand for joint leisure. Furthermore, if peers cut their absences short due to a tax reform, this might also have a direct influence on a worker's sick leaves that were inspired by joint leisure activities.

The peer effect is not driven by prolonged sick leaves (as seen in Model 5 in Table 3), and thus even if such spells imply an overlap between peers' sick leaves and a worker's sick leaves (allowing for joint leisure activities), they are not causing our peer effects. Furthermore, although the data reveals a hike in the number of workers absent at the same time as their peers during the winter season, these spells are related to contagious diseases such as the common cold and the flu. Otherwise workers and their peers are absent at different times of the year, thus leaving little scope for joint leisure activities.

If the costs of accessing information or the costs of joint leisure activities are cheaper when a worker lives close to his peers, this could imply enforced peer effects.<sup>11</sup> In Model 5 in Table 4 we test this by excluding workers whose peer groups comprise peers living in the same neighbourhood. Neighbourhood is defined as one of over 13,000 small geographical areas in Norway ("grunnkrets" in Norwegian). Ninety per cent of the sampled workers do not live in the same neighbourhood as their colleagues. However, as is readily seen in the table, when we

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<sup>11</sup> For example, Bellemare *et al.* (2010) find that very low or very high levels of peer pressure (measured in terms of information on peers' productivity) significantly decreases productivity.

exclude workers whose peer groups do comprise peers living in the same neighbourhood, we find a similar peer effect as when we estimate the peer effect on the complete sample of workers. Thus, even this exercise provides little evidence to support the notion that the peer effect is due to informational quality or joint leisure activities.

## **8. Discussion and conclusion**

The main goal of this paper has been to analyse social interaction effects in sick-leave behaviour at the workplace. The first question we asked was: Do co-workers affect each other's sick-leave behaviour, i.e. is there evidence of group influence on sick-leave behaviour? The answer to this question is clearly yes. The results suggest that social interaction effects in sick leaves in the workplace do exist, and the effects are noticeable in size. Even after controlling for endogeneity issues, our preferred estimate suggests that on average, for every sick day taken by a worker's colleagues, that worker will increase his absence by 0.4 days. Our result has clear policy implications for politicians and parties in the labour market, as well as for business manager. In addition to their direct effects, policies aimed at affecting sickness absence will also have an indirect social multiplier effect.

Few studies using non-experimental data have been able to tell exactly what mechanisms are behind the social interaction results. Since we have used non-experimental data ourselves, it is difficult to disentangle all possible explanations. We find no significant social interaction effects associated with sick leaves related to contagious diseases or to sick leaves related to i) musculoskeletal complaints, ii) fractures, dislocations, and sprains, or iii) acute stress. If increased effort by non-absent workers leads to deterioration in health and thereby causing sick leaves, one would suspect this effect to be visible through sick leaves related to i) through iii). Thus, we establish that the estimated social interaction effects are not due to contagious diseases, and they are unlikely to be due to increased effort by non-absent workers. Similarly, improved information quality cannot be raised as the main reason behind these social interaction results. Since the

influence from more permanent structures is taken into account by our fixed-effect approach, group identities (Akerlof and Kranton, 2005) and social norms (Elster, 1989a, 1989b) regarding the level of sick leaves are excluded as explanations.

Our workers apparently act as if they follow “tit for tat” or “quid pro quo” strategies, potentially reflecting reciprocal or conformity behaviour (Cialdini and Goldstein, 2004; Kolm, 2006). Kolm differentiates between three types of reciprocity: i) balance, ii) continuation, and iii) liking. However, liking is not relevant in our case. We observe that a worker extends his sick leave when his colleagues increase their absence rates. This can hardly be supportive of ii), since Kolm points out that this effect cannot be negatively motivated. On the other hand, fairness considerations (Fehr and Schmidt, 1999), which are typically considered to be part of i), do support our results. When sick-leave levels change among colleagues, a worker adapts his own behaviour accordingly to re-establish balance. Such a response could even reflect an automatic activation (Cialdini and Goldstein, 2004), e.g. following a social norm of retribution. Finally, continuation reciprocity cannot be excluded as an explanation for our peer effects, but we argue that this explanation needs additional assumptions and thus is less likely. When fellow workers reduce their number of sick days, a worker might also reduce his number of sick days in an effort to motivate peers to decrease their sick-leave levels even more in the future. If this response reflects continuation reciprocity, then we must assume that the peers’ initial sick-leave changes have made our worker suddenly realise that it is beneficial for the worker that his peers reduce their sick-leave levels even further. We have no evidence supporting such a notion.

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## Appendix

[ Table A1 around here]

[ Table A2 around here]

[ Table A3 around here]

Table 1. Changes net-of-tax rates for workers and peers

	All	Individual marginal synthetic tax groups of 2005 ( $\tau_{2005}$ )				
		35.8 (low)	27.1	35.8	47.8	51.3
<b>A) Individuals</b>						
$\Delta(1-t_t)$	0.011 (0.039)	-0.012 (0.131)	-0.014 (0.052)	-0.003 (0.036)	0.026 (0.030)	0.032 (0.016)
$\Delta(1-\tau_t)$	0.009 (0.045)	0.082 (0.105)	-0.057 (0.057)	-0.010 (0.031)	0.036 (0.027)	0.037 (0.013)
Number of workers	395489	1326	11746	190792	173846	14885
<b>B) Peers' <math>\Delta(1-\tau_t)</math></b>						
All workers	0.010 (0.024)	-0.001 (0.039)	-0.001 (0.033)	0.003 (0.023)	0.017 (0.021)	0.021 (0.017)
Low vacancy/unemployment growth	0.008 (0.024)	0.002 (0.039)	-0.001 (0.031)	0.003 (0.022)	0.016 (0.021)	0.021 (0.016)
High vacancy/unemployment growth	0.011 (0.024)	0.004 (0.024)	-0.002 (0.040)	0.004 (0.024)	0.017 (0.021)	0.021 (0.018)
Excluded down- or upsizing workplaces	0.011 (0.022)	0.002 (0.034)	0.001 (0.028)	0.005 (0.022)	0.017 (0.020)	0.020 (0.019)
No peers living as neighbours	0.010 (0.024)	-0.000 (0.040)	-0.001 (0.033)	0.003 (0.024)	0.017 (0.021)	0.021 (0.018)

Note:  $\Delta$  denotes the first-difference operator. For example,  $\Delta(1-t_t)$  implies  $(1-t_t) - (1-t_{t-1})$ , where  $t=2006$ . Standard deviations are reported in parentheses. High and low vacancy/unemployment rates are defined as municipalities experiencing a growth above or less than a municipality vacancy/unemployment growth rate of 0.2, respectively. Down- and upsizing workplaces are defined as workplaces experiencing employment growth of more than +/- five per cent. No peers living as neighbours discards workers and their peer groups if peers live in the neighbourhood (see subsection 7.4). Note that the marginal tax of 35.8 occurs twice over the income distribution. *35.8 (low)* denotes the low income case (see also Figure 1).

Table 2. The impact of colleagues' sick leaves on male workers' sick days

Model:	1	2	3	4	5	6
Peers' sick days	0.043**	0.316**	0.043**	0.416**	0.043*	0.416**
	(0.006)	(0.147)	(0.006)	(0.139)	(0.006)	(0.138)
(1- $\tau_{\downarrow}$ )	-16.594**	-15.575**	-14.706**	-13.260**	-14.709**	-13.255**
	(1.530)	(1.736)	(1.542)	(1.777)	(1.543)	(1.777)
<b>Additional controls:</b>						
Basic, peers, workplace, region, industry	Yes	Yes	Yes	Yes	Yes	Yes
Detailed income			Yes	Yes	Yes	Yes
Non-peer colleagues' sick leaves, industrial activity, family					Yes	Yes
Fixed worker effects	Yes	Yes	Yes	Yes	Yes	Yes
Estimation method	FD	FD-IV	FD	FD-IV	FD	FD-IV
<b>Quality of instruments</b>						
1.step: Peers' (1- $\tau$ )		-19.2**(3.97)		-20.3**(4.09)		-20.5**(4.08)
Kleibergen-Paap F:		135.4		142.8		145.2
Observations (workers)	399794	399794	399794	399794	397439	397439

Note: Table-elements (first two rows) report the coefficients and SEs on peers' sickness absence in linear regressions of a worker's sick days on peers' average sick days. Additional controls: *Basic*: intercept, age dummies (7, 5-year intervals), seniority (in years) squared, experience (in years), log weekly working hours, log hourly wages, proportion of colleagues within the age intervals given by the individual age dummies, log number of peers, and peer group averages; *Workplace, region and industry*: the number of workplace employees, log industry employment (three-digit SIC), and local vacancy/unemployment rate (municipality); *Detailed income*: control for income by decile dummies (and the corresponding peer group averages); *Family*: number of children below 7 years of age, number of children below 18 years of age, and marital status (and peer group averages); *Industrial activity*: a dummy if the worker receives income from industrial activity other than as a salaried worker (and peer group average). FD denotes fixed worker effect regressions based on first-differenced data, while FD-IV denotes similar effects where peers' sick leaves are considered an endogenous variable and thus instrumented. Full regression results are available from the authors upon request. Robust standard errors adjusted for peer group clustering are reported in parentheses. \*\*, \*, and x denote one, five, and ten per cent levels of significance, respectively.

Table 3. Robustness checks. FD-IV regressions

Selection:	All	Stable workplaces	Low V/U-growth	High V/U-growth	Short-term sick leaves
Diagnoses:	All	All	All	All	All
Model:	1	2	3	4	5
Peers' sick days	0.077 (0.102)	0.536** (0.169)	0.426** (0.148)	0.676** (0.319)	0.777** (0.225)
Peer group type	Pseudo	Real	Real	Real	Real
<b>Quality of instruments</b>					
Kleibergen-Paap F	543.0	84.9	118.1	41.0	36.0
Observations	389752	158847	193083	200538	376213
(workers)					

Note: See notes to Table 2 for details. All models comprise the control vector of Model 6 in Table 2. Dependent variable is a worker's number of sick days. In Model 1 the analysis employs pseudo-groups. *Stable* denotes workers employed in workplaces experiencing less than -/+ 5% employment growth. High and low V/U growth areas are defined as above or less than a municipality vacancy/unemployment growth rate of 0.2. *Short-term* denotes that all workers experiencing sick leaves of more than three months are excluded from the data.

Table 4. Alternative explanations. FD-IV regressions

Selection:	All				No neighbours among peers
Diagnoses:	Mcomp	FSD	AS	C	All
Model:	1	2	3	4	5
Peers' sick days	0.109 (0.064)	0.050 (0.052)	0.026 (0.033)	0.015 (0.026)	0.478** (0.139)
<b>Quality of instruments</b>					
Kleibergen-Paap F	151.4	151.4	151.4	151.4	143.1
Observations (workers)	393621	393621	393621	393621	362611

Note: See notes to Table 2 for details. All models comprise the control vector of Model 6 in Table 2. Dependent variable is a worker's number of sick days. Column headings Mcomp, FSD, AS, and C denote musculoskeletal complaints (Mcomp), fractures, sprains, and dislocations (FSD), acute stress (AS), and contagious diseases (C). *No neighbours among peers* denotes that workers with neighbours among the peer group are excluded from the regressions.

Appendix Table A1. Descriptive statistics

Individual-level (job) variables	Mean	Std.Dev.	Individual-level (job) variables	Mean	Std.Dev.
Sick leave days (SL)	13.86	40.16	Net-of-tax rate (1-t)	0.59	0.05
SL – days – Contagious	0.86	5.86	Synthetic net-of-tax rate (1- $\tau$ )	0.60	0.05
SL – days – Musculoskeletal complaints	1.85	14.81	Log weekly hours	8.13	0.37
SL – days – Acute strain	0.34	5.72	Log hourly wages	5.32	0.55
SL – days – Fractures	1.11	10.62	Seniority	8.06	6.52
SL – days – Short	6.49	15.11	Married	0.53	0.50
Age	42.75	10.24	# of children below 18 years of age	0.65	1.00
Log number of peers	2.64	1.40	# of children below 7 years of age	0.24	0.57
<b>Workplace-level variables</b>			<b>Region/industry-level variables</b>		
Log number employees	4.33	1.57	Log industry employment	8.72	1.26
Non-peer colleagues SL days	4.58	7.21	Local vacancy/unemployment rate	0.32	0.09

Note: Industry expresses three-digit SIC industry, while region expresses municipality.

Appendix Table A2. On the definition of disorders, illnesses, and diseases (from ICPC-2)

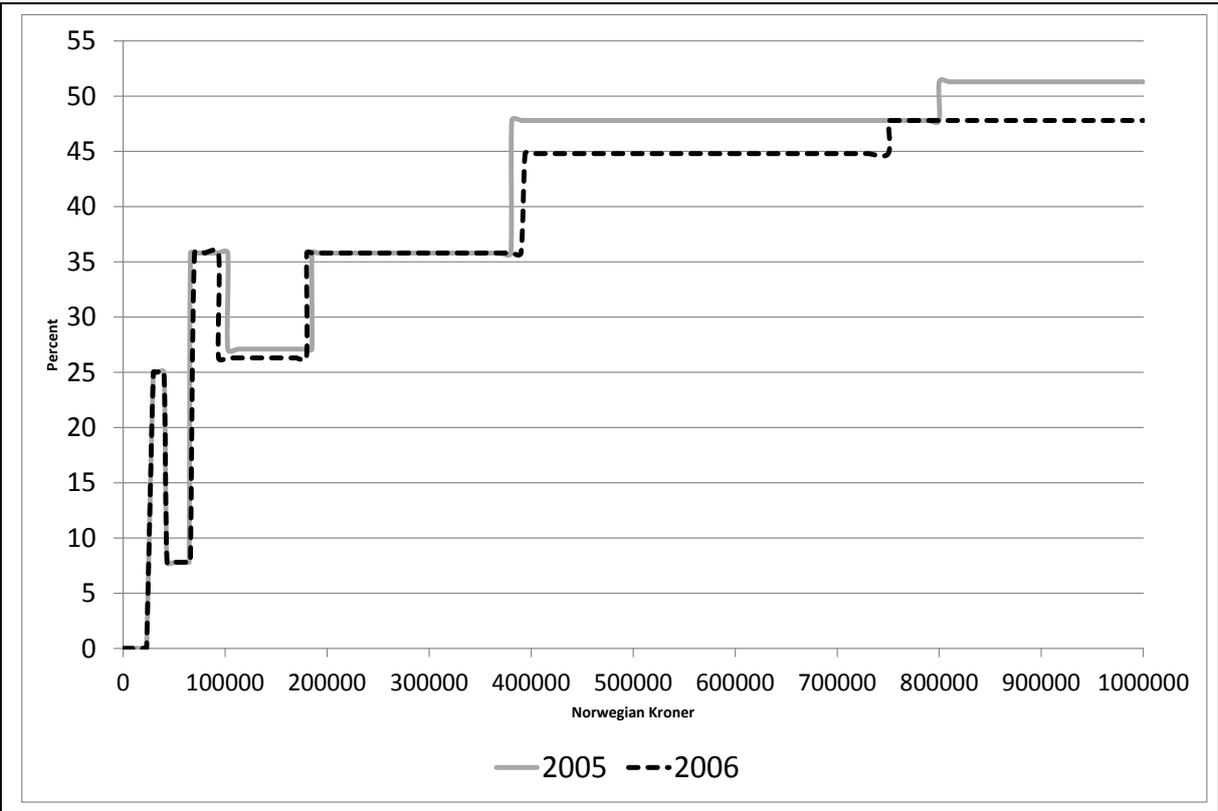
Contagious	A70, A71, A72, A74, A75, A76, A77, D09, D10, D11, D71, R05, R07, R08, R09, R21, R23, R29, R71, R72, R74, R75, R77, R78, R79, R80, R81, R83
Musculoskeletal complaints	L01, L02, L03, L04, L05, L06, L07, L08, L09, L10, L11, L12, L13, L14, L15, L16, L17, L18, L19, L20, L26, L27, L28, L29
Fractures, sprains, dislocations	L72, L73, L74, L75, L76, L77, L78, L79
Acute stress reaction	P02

Table A3. The impact of the net-of-tax rate on male workers' sick days.

Model:	1	2	3	4	5
(1- $t_i$ )	-18.420**	-17.776**		-17.686**	-22.841**
	(2.216)	(2.226)		(3.349)	(3.608)
(1- $\tau_i$ )			-16.374**		
			(4.156)		
<b>Additional controls:</b>					
Basic	Yes	Yes	Yes	Yes	Yes
Individual, workplace, region, industry		Yes	Yes	Yes	Yes
Fixed worker effects		Yes	Yes	Yes	Yes
Estimation method	FD	FD	FD	FD-IV	FD-IV
<b>Quality of instruments</b>					
Kleibergen-Paap F:				30406.7	61296.1
Observations (workers)	399794	399794	399794	399794	399794

Note: Table elements (first two rows) report the coefficients and SEs on (1- $t_i$ ) (and (1- $\tau_i$ )) in linear regressions of a worker's number of sick days on the net-of-tax rate. Additional controls: *Basic*: intercept, age dummies (seven, five-year intervals), seniority squared, experience squared, log hourly wage, and log weekly working hours; *Individual*: number of children below 7 years of age, number of children below 18 years of age, and marital status; *Workplace, region, and industry*: log number of employees (workplace), log number of employees in industry, and local vacancy/unemployment rate (municipality). FD denotes fixed worker effect regressions based on first-differenced data. FD-IV denotes fixed effect IV regressions based on first-differenced observations, where (1- $t_i$ ) is considered an endogenous variable and thus instrumented. In Model 4 we employ the marginal tax change conditional on the 2005 income and taxes. In Model 5 our instrument is a dummy indicating whether the tax reform affects the worker. The lower half of the table reports information on tests of the strength/appropriateness of the instruments. Full regression results are available from the authors upon request. Robust standard errors adjusted for peer group clustering are reported in parentheses. \*\*, \*, and  $\times$  denote one, five, and ten per cent level of significance, respectively.

Figure 1 The Norwegian marginal income tax reform of 2006



Note: The figure shows the marginal tax schedule in Norway excluded the northernmost municipalities based on nominal income (in NOK)(for incomes less than 1000000Nok, the tax rate does not changes above this limit).

Figure 2. The relationship between average worker net-of-tax change and changes in number of sick days (upper panel) and the similar relationship between peers' average tax changes and changes in number of sick days (lower panel)

