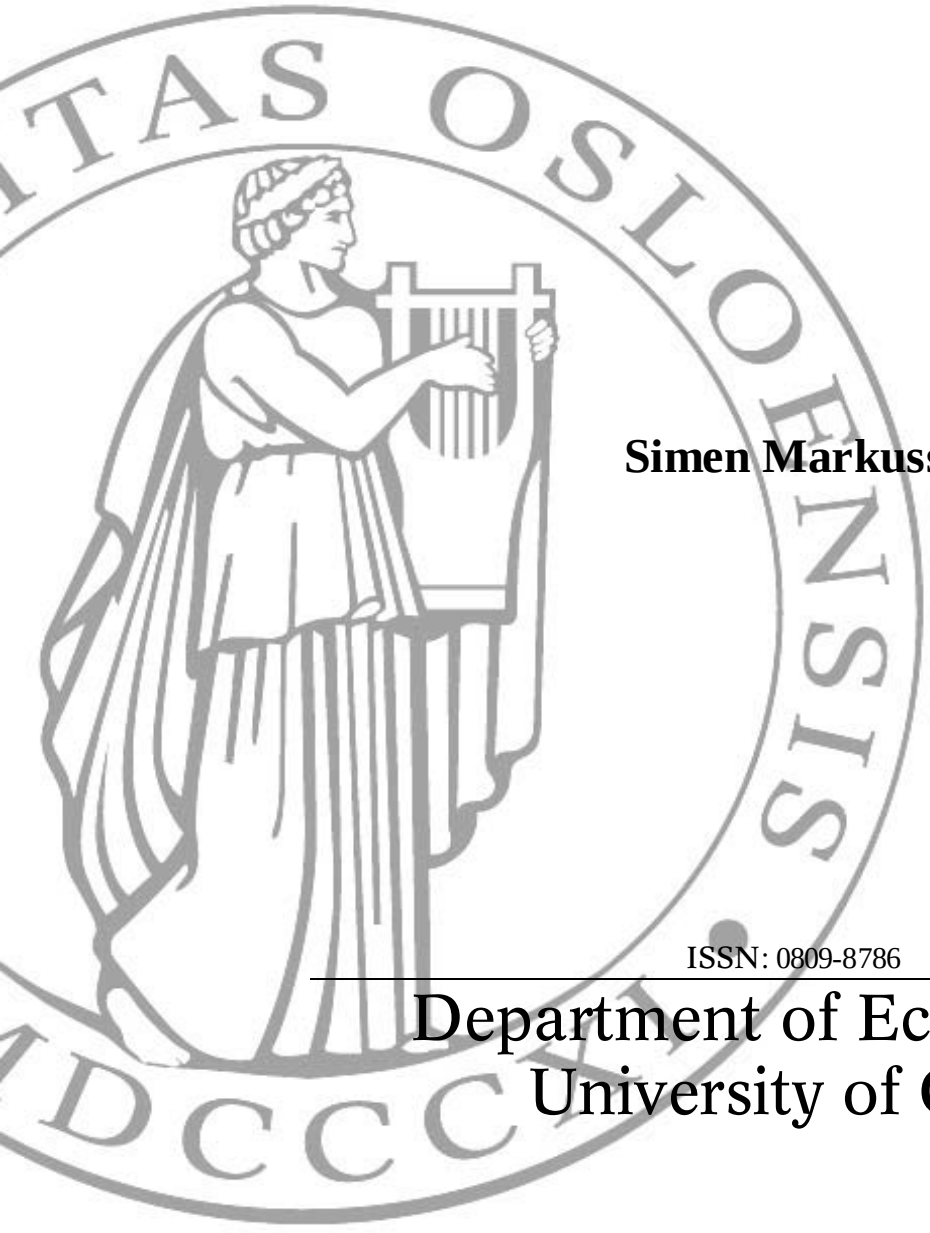
MEMORANDUM

No 19/2009

Closing the Gates?
Evidence from a Natural Experiment on Physicians' Sickness Certification



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Closing the gates?

- Evidence from a natural experiment on physicians' sickness certification

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March 2009

Abstract

This paper exploits a Norwegian physician directed reform aimed to reduce sick-leave. Physicians were required to consider part-time sick-leave as the default treatment and – in the case of long lasting full-time sick-leave – to file a report documenting why the worker was unable to perform any work related activities. The reform had a large impact, reducing sick-leave by 18.8 percent. The main effect came from reduced spell duration – which can be directly linked to the extended documentation requirement laid on physicians within the first 8 weeks of a sick-leave spell. Physician-directed policies may be an (cost-) effective way of reducing sick-leave.

Keywords: Labor market policies, sick-leave, physicians' gate keeping

JEL classification: H53, I18, J28

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1. Introduction

Overuse use of health related benefit schemes concerns policy makers in several countries. Programs such as paid sick-leave and disability insurance are important parts of many welfare states. But, they are also troubled with moral hazard leading to excessive use. In many countries, primary care physicians play a key role in targeting such benefits as they, through a medical examination, are set to "keep the gate" to the welfare state. Policies aiming to improve such gatekeeping are important as they make more generous insurance schemes possible without increased use and misuse.

July 1st 2004 Norwegian authorities launched a minor reform changing the regulations for physicians' sick-leave certification. The reform builds on a notion that inactivity (not working) is unsuitable as treatment for many kinds of illnesses such as back pain or mental illness. Instead, the reform was aiming to be "activity oriented" in the sense that primary care physicians were specifically instructed that unless a worker's medical status clearly makes working impossible or not recommendable, workers should remain active. To promote activity as treatment the reform package instructed physicians to encourage the use of part-time sick-leave for workers with health problems and, if no work-related activity was carried out by the worker after eight weeks of sick-leave, to file a report to the social security administration stating – on medical grounds – why inactivity is necessary. The reform is presented in detail in section 2.

Perhaps surprisingly, sick-leave fell by around 20 percent at the time of the reform, corresponding to a 1.34 percentage point increase in labor supply. This is a lot compared to any sickness insurance reform and it is particularly impressing keeping

in mind that no economic incentives were changed.[2] The fact that the reform neither changed incentives for workers nor for physicians probably made it a lot easier to implement politically. If the reform really can account for the drop in absenteeism it should also be relevant for policy makers elsewhere.

The role of primary care physicians in sickness certification

Primary care physicians play an important role in many welfare states (Scott, 2000). In Norway, like many other countries, physicians are asked to certify sick-leave, disability insurance3, referrals to specialist treatment, drug prescriptions, drivers-licenses and more. In this respect, physicians are gatekeepers to a substantial part of publicly provided welfare.

There is a literature on physicians' gate keeping, both in health economics and public health (Scott 2000, Brekke et.al 2007, Dusheiko et.al 2006). Typically, the physician-patient relationship is seen as one of agency, where "patients (principal) are less informed than physicians (agent) about the relationship between health care and health status" (Scott 2000, p.1178). Some analyze physicians as "double agents"; serving two lords at the same time – their patients and the insurance provider (Blomqvist, 1991). This has led researchers to analyze the potential tension inherited in being both their patients' advocate and the welfare state's gatekeeper (Lindes, 1988).

Serious concerns are raised that physicians are unable to serve as gate-keepers (Carlsen and Nyborg 2009, Stone 1986). The typical argument is that there is private

[2] For comparison: Johanson and Palme (2005) evaluates a Swedish reform where the replacement rate for sickness was cut from 90 percent til 65 and 80 percent, depending on spell length, and report a reduction of .93 percentage points, Lindbeck et.al (2006) studies the effect of reduced employment protection and find that sick-leave was reduced by .2-.3 days per year (around .1 percentage point).

information in health such that physicians are unable to observe the true health status of their patients. When seeing a patient claiming unobservable sickness, the physician must choose whether or not to put faith in his patient's self-assessment. A typical physician will put more weight on avoiding declining truly sick patients than on reducing moral hazard (Stone 1984, p.150). This has led authors to conclude that the gates are virtually wide open (Carlsen and Nyborg, 2009). Note that the agency problem is now changed. In this line of thought, patients are the ones with private information (agent) and the insurance provider is the principal. The physician serves as a screening mechanism – a truth-telling device – to reduce the informational asymmetry.

Markussen et.al (2009), with help of several variance decomposition exercises, report that physicians differ in "strictness". They find that around 2 percent of the variation in sickness propensity is due to the physician. Large variation between physicians is also found by Wilkin (1992), for referrals to specialist treatment. The fact that there is variation indicates that gate keeping is possible. However, we do not know whether the variation is mainly due to permanent differences in practice style variation between autonomous physicians, nearly impossible to change by policy, or if physicians actually can be instructed to do more or less strict gate keeping.

Question, method and summary of the results

This paper evaluates the physician directed reform launched July 1st 2004 in Norway. The main purpose is simply to investigate how this reform affected sick-leaves in order to provide policy makers and researchers elsewhere with new knowledge on the effect of physician directed sick-leave policy. However, in addition to doing so the paper is also relevant for the question of whether physicians are at all

capable of being gatekeepers, and if such gatekeeping can be affected by public policy. Since the reform is completely physician oriented it should have no effect if gatekeeping is impossible.

Unfortunately the reform was not designed as a social experiment with randomized control and treatment groups. All physicians and workers were affected at the same time and by the different parts of the reform package. We are thus left to compare various aspect of sick-leave before and after the reform as well as to inspect the exact timing of these effects in order to be as certain as possible that the changes we find actually are the result of the reform. Nevertheless, even if the reform design to some extent limits the possibility to quantify the effect of each part of the reform its major impact clearly displays the reform's relevance for policy as well as research.

The results indicate that the reform made sick-leave spells shorter and less frequent. Sick-leave fell by as much as 11.7 percent due to reduced spell duration. The results indicate that the hazard from sick-leave was significantly improved during the first 8 weeks of a spell – indicating that the additional documentation required by physicians within 8 weeks from the spell started had a major impact. The non-parametric "placebo regression" robustness checks, presented in section 4, clearly show that this effect came exactly at the time of reform – indicating that it was the reform – not something else – that caused the drop.

Sick-leave spells did not just get shorter, they also got less frequent. Around the reform, reduced spell incidence led to a reduction in sick-leave of 7.1 percent. However, the robustness tests indicate that a substantial part of this drop came ahead of the reform implementation. How this drop should be interpreted is thus a bit unclear. This coincides with when the need for reform was publicly debated and may thus be a (temporary) attention effect. However, one can also argue that what makes

this reform so successful is that it improves the bargaining power of physicians towards their patients when negotiating then need for sick-leave. If so, common knowledge of the reform to come may have just as much effect as the actual implementation.

2. The reform and environment

The Norwegian sickness insurance system

Nearly all Norwegian workers have full wage compensation during sick-leave for up to one year. During the first 16 days of absence, the expenses are covered by the employer, after which the social security system foots the bill[3]. The general rule is that absence spells lasting more than three days must be certified by a physician, although certification is not required until the 9th day for employees in firms participating in the so-called IA-agreement.[4]

The reform

On March 26th 2004 the Norwegian cabinet proposed a change in legislation regulating sickness insurance. Formally, the reform consisted of six parts, which are all presented below[5]. Several of these parts are, however, fairly vague and/or they were also required prior to the reform (see below for a brief discussion).

[3] There is an upper ceiling on the sickness insurance benefits paid out be the social security system (corresponding to a yearly income of around 60,000 USD), but employers typically cover the wedge between the maximum social security payment and normal earnings.
[4] Frequently absent employees need certification from the first day of absence.
[5] This section is based on Ot.prp nr.48 2003-2004, a proposal from the Ministry of social affairs to change the law regulating the social security system (folketrygdloven).

(A) Documentation and evaluation of work ability: Physicians were explicitly required to evaluate whether workers were able to perform work or work-related activities when sickness certificates were discussed. Physicians were however also required to do this prior to the reform. The change was merely that this was explicitly written into the law. The sickness certification-form was also slightly changed in this regard.

(B) Part-time sick-leave was made default treatment: Physicians were instructed to consider part-time sick-leave the "default treatment", such that workers with "some" work ability should work part-time.

(C) Extended sick-listing documentation for long lasting inactive spells: Physicians were required to provide an extended (medical) certification for workers with absence spells lasting longer than eight weeks if no work-related activities were performed, documenting that inactivity were part of the treatment.

(D) Targeting the system with "active sick-leave": An alternative to ordinary sick-leave is something called "active sick-leave" (AS). AS implies that the employee – when sick – can choose whether and how much to work on a day-to-day basis. As a main rule it was not meant to last longer than 12 weeks. However, in practice it became much used and the spells lasted for a long time (around 180 days on average). One suspected that it was often overused since neither the physician nor the employee nor the firm had any incentives for terminating the absence spell. The reform restricted the use in the sense that part-time sick-leave should be preferred to AS if the employee were able to perform *some* of his regularly tasks. The length of AS was also restricted to four weeks (main rule) and eight weeks in exceptional cases.

(E) Slight reduction in self-reported absence days: In the Norwegian system employees are given a quota of four times three days with self-reported absence days,

i.e. where a certification from a physician is not required. Prior to the reform, employees receiving a certificate the fourth absence day did not use their "quota" of self-reported absenteeism. The reform changed this such that self-reported days prior to certified absenteeism counted as self-reported absenteeism.

(F) Sanctioning of physicians that violate regulations: The law allowed for excluding physicians from the "privilege" of certifying sick-leave and other social security relevant conditions such as disability etc., if the physician repeatedly violated the rules and regulations.

In my view, the reform has two potentially important implications for sick-leave certification. The first is that physicians are asked to have part-time sick-leave as default and only consider active sick-leave in particular cases. Several papers have shown the importance of default alternatives, in as different settings as organ donation decisions (Johnson and Goldstein 2003, Abadie and Gay 2004), car insurance plan choices (Johnson et al. 1993), car option purchases (Park, Jun, and McInnis 2000), consent to receive e-mail marketing (Johnson, Bellman, and Lohse 2003) and retirement savings (Beshears et.al 2006). It is thus plausible that changing default treatment may affect physician behavior.

Potentially important is also the requirement in (C) where physicians are required to provide medical documentation for why work related activities do not take place if workers have been on sick-leave for eight weeks. Providing such documentation falsely can be uncomfortable for both physician and patient. Knowing that such documentation must be provided after eight weeks may change physician behavior, not only when a full-time spell has lasted eight weeks, but in general.

Timing and implementation

According to the legislative proposal, Ot. prp. nr 48 (2003-2004), preparations for the reform started in December 2003. February 13th 2004 a draft was sent the relevant organizations and interest groups for a public hearing. The deadline for responding was March 5th. The final legislative proposal was sent to the Parliament March 26th which approved it June 18th 2004. The reform was to be implemented July 1st 2004. The legislative change did not cause much parliamentary debate and was approved unchanged.

Prior to the reform there was some public debate. According to my knowledge, the first time the reform was mentioned in the press was following a public lecture for medical students in Trondheim February 2nd 2004. The reform caught some attention in the public press throughout spring 2004.

Following the new regulations, a new form for sickness-certification was put into use from July 1st. Illustrating enough, the new form was called "Medical evaluation of work ability during sickness". The new form changed the default outcome from being sick-listed full-time to being in work – either full-time or part-time – but with some adjustments made on the workplace to make this possible. This form had (new) questions like: - *Which measures should be taken such that the worker can remain in part-time work/work-related activity?* - *Eventual suggestions for practical adjustments on the workplace?* - *Are there any important medical or treatment related reasons why the person can not take part in work-related activities?*

The formal arrangements that take place on July 1st 2004, such as the new form and documentation routines, are suitable for identification. However, the excess public attention on sickness certification throughout spring 2004 may also have had an effect on physicians as we will see below.

3. The data and institutional framework

Institutional framework

Most Norwegian workers are provided full sickness insurance, i.e. the replacement rate for sickness is 100 percent. Sick-leave lasting more than three or eight days must be certified by a physician[6]. One can be absent for a maximum period of one year. If a worker does not return to work after 1 year of sick-leave, the employment contract is dissolved and the worker is provided a rehabilitation program and may eventually apply for disability. The first 16 days of a sick-leave spell, the cost of sickness insurance is covered by the firm. The remaining period is paid for by the social security administration.

Data and descriptive statistics

This paper makes use of administrative register data from Norway. All absence spells lasting more than three or eight days – depending on the type of firm – must be certified by a physician. When certification takes place, this is registered and the absence spell occurs in our dataset. These data are then – if desired – merged with other public registers to obtain rich sets of covariates including age, gender, civil status, number of children, education, type of job, firm, panel physician etc. If not otherwise specified, the population used in this paper is the entire Norwegian

[6] Workers in firms not member of the tri-partite agreement ”Agreement for and Inclusive Labor Market (IA)” between the government, trade unions and workers unions have three non-monitored days of sick-leave before they must visit a physician to get the spell certified. Workers in firms that are member of IA have eight such days per spell. In 2004 around half of the employees worked in such firms.

(working) population. Aggregations of these data are in most cases publicly available from Statistics Norway's webpage.

Table 1 lists several important data characteristics for the relevant years, 2003-2005. There is a substantial drop in absence days per worker from 2003 to 2004, and it stays rather constant from 2004 to 2005. There are substantial reductions from 2003 to 2004 both in the number of new absence spells, their average duration and their average intensity (degree of part-time). The number of workers increases slightly from 2003 to 2005 while unemployment stays rather constant.

Table 1: Absenteeism in Norway: descriptive statistics

Absence spells are categorized after their starting date such that all spells starting in year t are included in this year, even if it is ongoing also in t+1.

	2003	**2004**	**2005**
Absence days per worker	23.91	19.39	19.78
Number of new absence spells	1 459 671	1 284 074	1 360 999
Average spell duration	40.44	38.78	38.04
Average spell intensity	91.90	88.62	87.44
Number of workers	2 269 000	2 276 000	2 289 000
Unemployed workers	107 000	106 000	111 000
Unemployment rate	4.5 %	4.5 %	4.6 %

Figure 1 shows the weekly absence rate from 2002 to fall 2006 decomposed into three different categories: full-time "ordinary" sick-leave (FT), part-time sick-leave (PT) and active sick-leave (AS). One should notice that these categories are not as clear as it may seem. The degree of part-time – i.e. "spell intensity" – is registered both at the beginning and the end of a spell. Part-time is more common at the end than at the beginning of a spell. There are also several "intensity categories"; part-time from 20 to 90 percent, and full-time which is 100 percent. Active sick-leave spells

may also be part-time. I divide all spells into three groups; if a spell is registered as active sick-leave – regardless of its intensity – then it is categorized as active sick-leave (AS). Then, if it is not AS and spell intensity is less than 100 percent at the end of the spell, it is categorized as part-time (PT). The remaining spells are denoted full-time spells (FT).

There is strong seasonal variation in sick-leave, with peaks in mid December and January-February and slumps in July and August, which is also the summer holiday season in Norway. The time of reform – July 1st 2004 – is marked with a solid line. The dotted horizontal lines before and after the reform marks the average rate the preceding and following year of the reform.

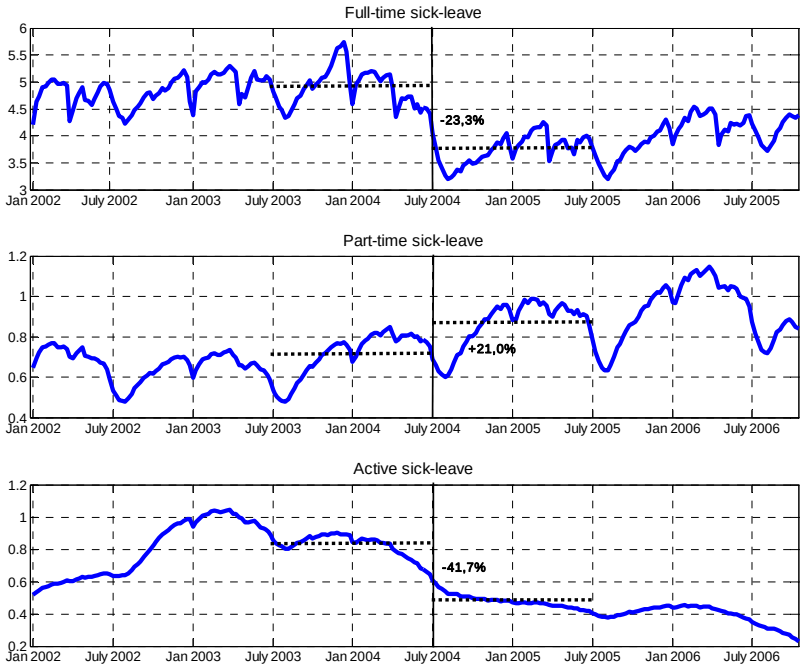

Figure 1: Sick-leave in Norway 2002-2006.

The figure shows the weekly sick-leave rate in Norway from January 2002 until October 2006, in three categories: full-time sick-leave (upper panel), part-time sick-leave (middle panel) and active sick-leave (lower panel). The time of reform is marked with a vertical line. The dotted horizontal lines show the mean in the twelve months preceding and succeeding the reform.

Full-time sick-leave fell by 23 percent, or 1.14 percentage points, from the year before to the year after the reform. Part-time sick-leave increased by 21 percent (0.15 percentage points) and active sick-leave fell by almost 42 percent (0.34 percentage points). In total, sick-leave fell by almost 21 percent or 1.34 percentage points. The increase in part-time sick-leave was in fact intended, as part of the reform's scope was to use part-time instead of full-time sick leave. However, an increase in labor supply of 1.34 percent is substantial and if it can be accounted for by the reform itself – and not other trends or factors – this nearly cost-less reform was a success.

Figure 2 shows the distribution of sick-leave *per physician*. To reduce the statistical uncertainty the sample only includes physicians with at least 350 employed patients *before and after* the reform (2993 physicians, roughly ¾ of all physicians). The upper panel (a) shows the distribution of mean sick-leave among the physicians' patients, before and after the reform. One can see how the distribution shifts clearly to the left. The lower panel of figure 2 (b) shows the distribution of percentage change in mean absence rates among the physicians' patients' from the year before to the year after the reform.

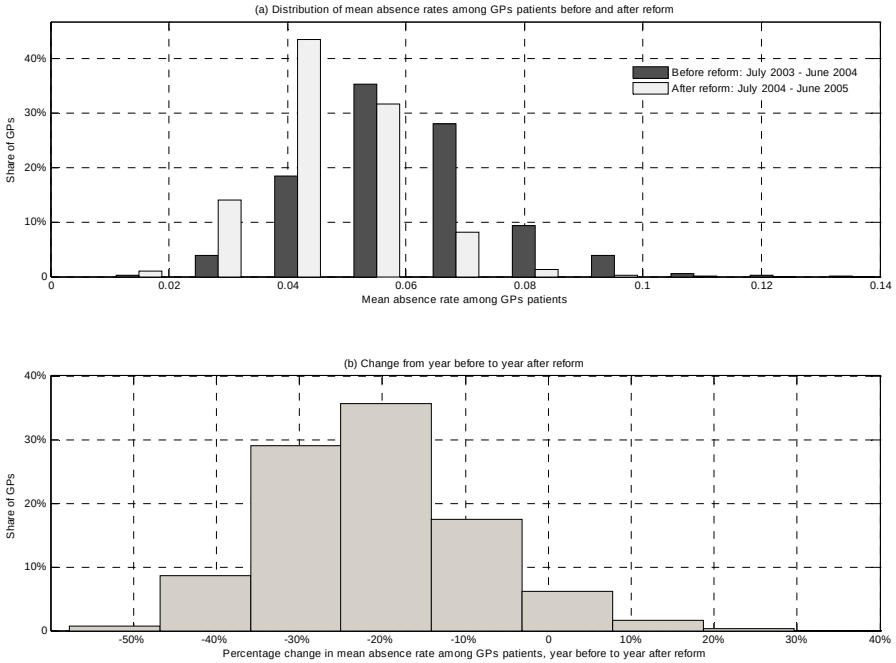

Figure 2: Distribution of physicians' sickness certification before and after reform.

Table 2 presents descriptive statistics for physicians. The physicians are grouped in quartiles, after how their patients' sick-leave changed at the time of reform.

The various physician characteristics show no clear differences between physicians in the different quartiles. Interestingly enough, there seems to be no association between the number of patients and physicians' responses to the reform. There is however some interesting differences in the sick-leave statistics. First, physicians with patients whose sick-leave rates fell the most (in percent), were also the ones with most full-time sick-leave before the reform. They were also the ones certifying most active sick-leave. There was large variation in active sick-leave between the four groups prior to the reform, but very small differences after the reform. The physicians with the largest reduction in sick-leave were also the ones with the smallest increase in the use of part-time sick-leave. This indicates that there

may be less substitution between active sick-leave and part-time sick-leave than one could suspect.

Table 2: Physicians

The physicians are grouped in quartiles after how much less their patients were on sick-leave the year after the reform compared with the year before. The 1st quartile contains the physicians whose patients' sick-leave fell the most, e.g. the physicians to the left in panel (b) in figure 2. Only physicians with on average at least 350 employed patients are included.

Physician descriptives	**1st quartile**	**2nd quartile**	**3rd quartile**	**4th quartile**
Physician age	47.7	47.8	47.5	47.4
Share females	.26	.29	.28	.28
Share specialists	.48	.51	.47	.49
Share co-practice	.078	.063	.059	.068
Number of patients (before/after)	1316 / 1314	1362 / 1367	1353 / 1354	1312 / 1315
..employed (before/after)	575 / 572	616 / 615	611 / 610	592 / 592
Patient coverage[7] (before / after)	.962 / .976	.949 / .956	.953 / .960	.937 / .953
	1st quartile	**2nd quartile**	**3rd quartile**	**4th quartile**
Sick-leave statistics				
Full-time sick-leave (before/after)	.0515 / .0322	.0478 /.0349	.0463 / .0371	.0416 / .0387
..% change	-37.2	-26.8	-19.5	-6.1
Active sick-leave (before/after)	.0073 / .0026	.0065 / .0027	.0061 / .0028	.0050 / .0029
..% change	-60.8	-50.9	-44.3	-29.0
Part-time sick-leave (before/after)	.0069 / .0077	.0067 / .0080	.0058 / .0084	.0063 / .0085
..% change	21.0	27.3	33.0	44.6

Reform environment

The reform was discussed during spring 2004 and implemented July 1st the same year. So far we have seen that sick-leave was substantially reduced the year after

[7] The actual number of patients divided with desired number of patients.

the reform, compared to the year before. It is then natural to ask, was it really the reform that caused the drop in sick-leave? Unfortunately, I do not have any proper social experimental setting with control and treatment groups. All workers and all physicians were affected by the reform at the same time. There is however also an advantage to this, compared to many other non-randomized experiment-like settings: there is no selection into treatment. A fundamental empirical question is whether we should believe that it was the reform – and not something else – that caused the drop in sick-leave. There are three reasons why it seems reasonable to believe that the drop in absenteeism actually was caused by the reform: (1) Its discontinuity, (2) not much else happened at the time and (3) it only affected sick-leave certified by physicians.

The drop in sick-leave was highly discontinuous and occurred exactly at the time of the reform. The sharp discontinuity makes many other potential reasons, like demographic change or other changes that could cause trends in sick-leave, implausible. Such processes are slow moving – the change in sick-leave was anything but slow.

There is not much else that could have caused the drop. One obvious candidate could be business cycle changes, as sick-leave tends to be pro-cyclical (Arai and Skogman Thoursie 2005, Askildsen et.al 2005, Nordberg and Røed, 2006). However, at the time of the reform, neither unemployment nor employment was changing much. Figure 3 below, panels (b) and (c), draw employment rates and unemployment rates for men and women from the second quarter of 2000 to 2007. In 2001 and 2002 employment was high. 2003 to 2005 the Norwegian economy experienced a slight recession, and in 2006, unemployment decreased and employment rose. It seems highly unlikely that the drop in sick-leave should be caused by changes in

employment or unemployment, as these were virtually unchanged the year before, during and after the year after the reform.

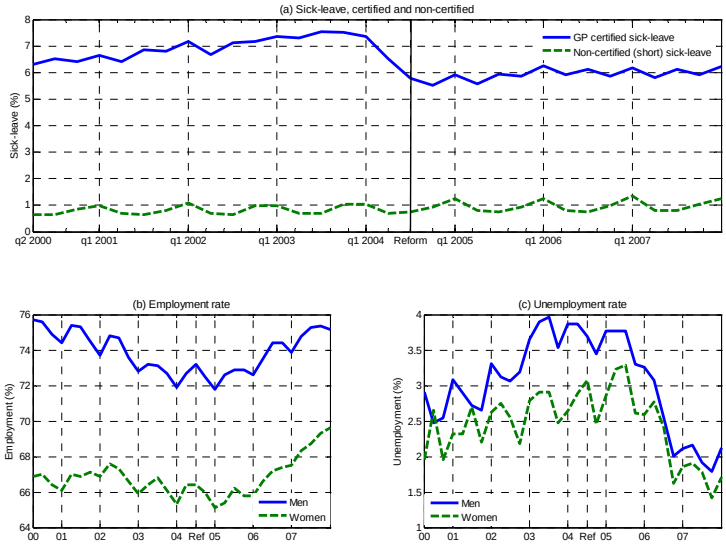

Figure 3: Certified and non-certified sick-leave and business cycle conditions.

I have also investigated a series of other possible explanations – including membership in the IA-agreement, prohibition of smoking in Norwegian bars and restaurants and sorting of marginal workers out of the labor force – all with the same conclusion: no other changes are sudden and large enough to cause such a drop in absenteeism.

Imagine that – despite it may seem unlikely – an exogenous factor other than the reform was affecting absence behavior at exactly the same time. If this were a health shock of some kind or a change in economic incentives we would expect it to reduce both certified and non-certified – i.e. short-term – sick-leave, and maybe even with roughly the same amount. This is however not the case. Figure 3 panel (a) shows quarterly non-certified and certified sick-leave rates before and after the reform. As is clearly shown non-certified sick-leave was not reduced at the time of the reform. If anything, there seems to be an increasing trend throughout the whole time

period. Hence, we can rule out all factors that should affect non-certified and certified sick-leave at the same time.

4. Sick-leave before and after the reform

Normally we measure the sick-leave rate of a person or a population within a time-interval as the share of working time spent on sick-leave. It is useful to think of the sick-leave rate as a stock variable with flows in and out of sick-leave. In a given period, there will co-exist spells starting at different dates – of various vintages so to speak. If the reform has an impact on either inflow to or outflow from sick-leave, the effect will be dynamic. A permanent five percent reduction in the inflow to sick-leave will reduce the absence rate immediately. However, the full effect will not appear until twelve months later. For the same reasons will a temporary shock in the inflow to sick-leave also have longer-lasting effects, although not permanent.

Inflow to sick-leave

The natural way to study the inflow to sick-leave is by calculating the incidence rate. I do this, on a weekly basis, by measuring the number of new spells divided by the population at risk. In practice this is done in the following fashion: For every week I define the risk set – the number of workers at risk of beginning a new absence spell – as the number of employed workers minus the number of workers already on sick-leave at the beginning of this week. Hence, I neglect the problem that the risk set changes within the week as some workers return from sick-leave – and then is at risk again – and some workers begin a sick-leave – and hence should be removed from the risk set. However, I do believe that the errors originating from this is of minor importance. I also neglect holidays. This is important for the weekly

incidence rate as the risk-set is reduced during holidays. However, for comparison before and after the reform it will not create major problems as the same holidays occur every year.

I compare all weeks the year before (July 1st 2003 – June 30th 2004) with the year after the reform (July 1st 2004 – June 30th 2005). The incidence rate the year before and after the reform is then simply the mean weekly incidence rate, before and after the reform.

Figure 4 draws the incidence rate from January 2002 until the fall of 2006. The vertical line marks the time of reform and the horizontal lines mark the mean incidence rate the year before and the year after the reform. The upper panel show that the number of new full-time spells per 1000 workers fell by 10 percent, from 1.65 to 1.48 a day, from the year before to the year after the reform. Notice that the scale differs between the panels and that the number of new part-time and active sick-leave spells is dwarfed by the number of new full-time spells. The reason why part-time and active sick-leave is important is not because there are many such spells, but because these spells tend to last very long.

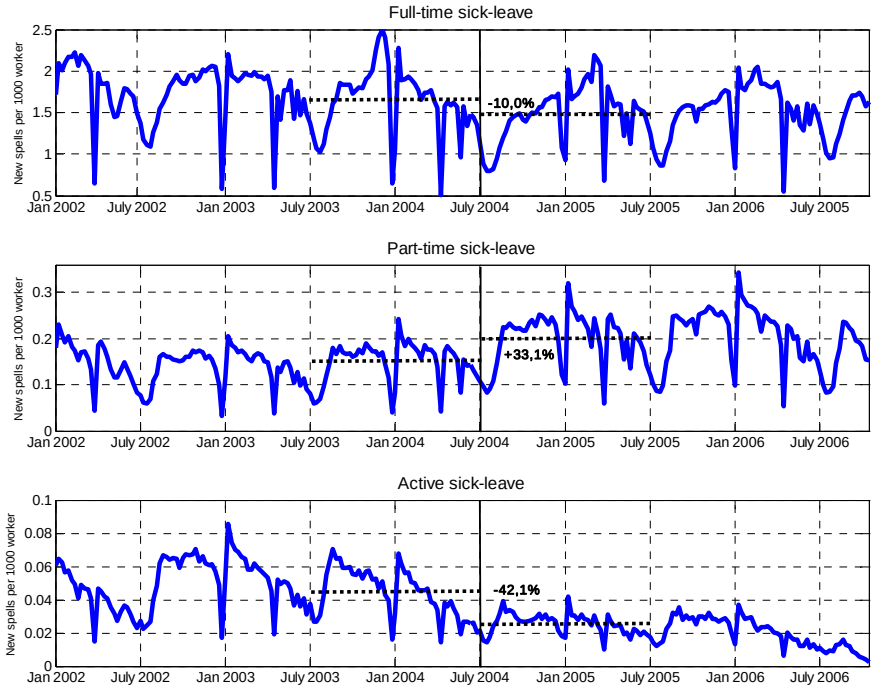

Figure 4: Incidence rate per 1000 worker/day. The incidence rate is calculated for periods of 1 week's length.

The number of part-time spells increased by 33.1 percent whereas the number of active sick-leave spells fell by 42.1 percent. In table 3 I investigate the change in the incidence rates more formally by testing the statistical significance of the change.

The changes in incidence rates are substantial, and statistically significant. Inflow to full-time spells fell by ten percent. There is also a clear shift from active sick-leave to part-time spells, as it was intended by the reform.

Table 3: Change in incidence rate

Change in spell incidence rate per 1000 worker at risk, from year before to year after the reform.

	Year before	Year after	Change	% Change
Full-time	1.647	1.482	-0.165	-10.0%
(s.e.)	(0.027)	(0.026)	(0.037)	
Part-time	0.150	0.200	0.050	33.0%
(s.e.)	(0.008)	(0.009)	(0.012)	
Active	0.044	0.026	-0.019	-42.1%
(s.e.)	(0.004)	(0.003)	(0.006)	

Outflow from sick-leave

I use an approximation to the non-parametric hazard function to quantify outflow from sick-leave, before and after the reform. Following Wooldridge (2002, p.687), let *T* denote the length of a sick-leave spell measured in days, at which it ends. The cumulative distribution function (cdf) of T is then $F(t) = P(T \le t)$. In continuous time, the hazard function is defined as:

$$\lambda(t) = \lim_{h \downarrow 0} \frac{P(t \le T < t+h \mid T \ge t)}{h}$$

We can approximate this function by using that $P(t \le T < t \mid T \ge t) \approx \lambda(t)h$ for "small" *h*. The approximated hazard can then be written in terms of the cdf.[8]

$$\lambda(t) \approx \frac{1}{h} \frac{F(t+h) - F(t)}{1 - F(t)} \qquad (1.1)$$

The object of interest is to compare this hazard rate before and after the reform, to see if the return probabilities from sick-leave are changed. When I take (1.1) to the data I

[8] The only reason this is an approximation is that *h* is not approaching zero.

first have to decide on the size of *h*. If e.g. *h* is measured in weeks, we implicitly assume that the daily return probability is the same for all days within this week. This assumption is obviously violated, and even more so the larger *h* is. On the other hand, by increasing *h* we reduce sample noise. I have chosen to use weeks and months as period length, such that $h = 7$ the first 13 weeks of a spell and $h = 30$ the remaining time up to maximum one year[9]. It is also important to notice that spells starting after July 1st 2003 may be affected by the reform, as they may carry on also after July 1st 2004. To solve this I compare all spells starting between July 1st 2002 and June 30th 2003 with those starting between July 1st 2004 and June 30th 2005. I will return to potential trend-effects later, when I discuss whether the reform had any permanent effects.

The hazards, before and after the reform, are displayed in figure 5. The three left panels (a, c, e) show the hazard rates before and after the reform for full-time spells, part-time spells and active sick-leave spells. Panel (a) shows that the probability of returning to work from an ordinary full-time spell is almost 0.06 each day during the first week. Thereafter it falls and after four months, the daily return probabilities are around 0.005. Panels (c) and (e) show the hazards from part-time and active sick-leave spells. The hazard rates illustrate that these spells are substantially different from the "ordinary" full-time spells. The immediate return probabilities are very low, whereas they increase up to the fourth week for part-time sick-leave and almost throughout the whole year for active sick-leave. The right panels (b, d, f) show the (absolute) change in the hazard rate. The probabilities of returning to work from a full-time spell were higher after the reform than before, regardless of duration. However, after four weeks, the difference is not statistically significant at 95 percent

[9] The last "month" is somewhat longer in order to finalize the year.

level. Do keep in mind that this purely non-parametric way of calculating (and comparing) the hazards results in much larger standard errors than a parametric approach. With more structure on the hazard rate, the difference would have been significant, but the possibility of comparing *when*, during a sick-leave spell, outflow probabilities changed would have been lost. The standard errors (se.) are calculated for each point as the se. of a rate[10]. As the se. depend on *n*, the se. consequently depend on the period length as longer periods (larger *h*) results in more observations. Standard errors thus increase with duration – as the sample becomes smaller. From week 14 I use months instead of weekly time intervals (*h* = 30 instead of *h* = 7*)* and thus the standard errors are reduced.

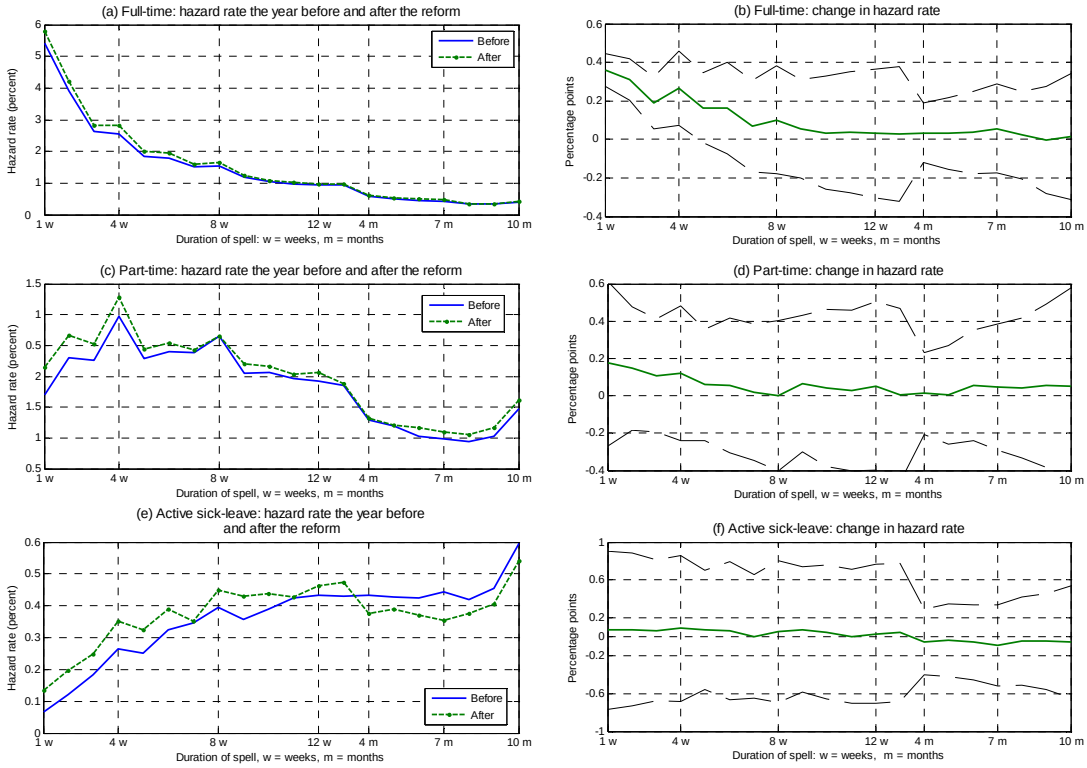

Figure 5: Hazard rate, and change in hazard rate, before and after the reform

Return probabilities from sick-leave were higher after than before the reform. For full-time spells, the difference is almost .4 percentage points the first week. This

[10] The standard error of *p* is $\sigma = \sqrt{p(1-p)/n}$, where *n* is the number of observations at risk.

is an increase in the hazard by 6.6 percent. After the reform, physicians were required to provide an extended medical certification for workers on full-time sick-leave if the spell lasted more than eight weeks. The change in the hazard rate was somewhat larger the eight' week, than the week before or after. The percentage change in the hazard was 4.5 percent in week seven, 6.6 percent in week eight and 4.7 percent in week 9. Return probabilities from part-time sick-leave were improved after the reform, for all spell durations. Return probabilities from active sick-leave were improved up to week 13, thereafter they were reduced.

Robustness: long-term trends

Directly from figure 1 we obtain several interesting observations:

1. Full-time sick-leave grew slowly from 2002 until the spring of 2004 when it dropped. A comparison with figure 4 indicates that the reason sick-leave trended upwards must have been increasing spell length.
2. The year after the reform, full-time sick-leave remained low. The second year it was slightly higher. This indicates that the weak upward trend prior to the reform continued also after the reform, or, that part of the effect was temporary.
3. Part-time sick-leave increased all years after July 2002. Hence, the increase from the year before to the year after the reform was to a large extent a continuation of a long-term trend.
4. Active sick-leave also fell prior to the reform and decreased dramatically during spring 2004. Hence, part of the difference from the year before to the year after the reform seems like a continuation of a trend.

To distinguish between long-term trends and the more sudden reform effect I construct a panel dataset for the years 2002-2006 containing incidence rates and calendar information. I then regress the weekly incidence rates on a reform dummy combined with either yearly dummies, monthly dummies and a time trend, weekly dummies and a time trend, yearly and monthly dummies etc. I report only the reform coefficient. All the results are available on request. The results are shown in table 4.

Table 4: Robustness check for incidence rate

The table shows the estimated effect of the reform on the incidence rate of sick-leave using various empirical specifications. All equations are estimated using OLS.

	Full-time	**Part-time**	**Active**
Year dummies	-0.29***	0.03**	-0.013***
Year and month	-0.15*	0.042***	-0.013***
Year and week	-0.12*	0.048***	-0.012***
Month, linear and squared trend	-0.17**	0.055***	-0.015***
Week, linear and squared trend	-0.16***	0.059***	-0.015***
# obs.	251	251	251

* = p<0.1 , ** = p < 0.05 , *** = p < 0.01

For full-time and part-time spells, the estimated effects are roughly the same as the simple before and after comparison above. Hence, for these types of spells, the results in table 4 seem robust to various specifications for time trends, seasonal patterns etc. For active sick-leave, the estimated effect on the incidence rate is somewhat smaller than the before and after comparison. Inflow to active sick-leave was already decreasing the year prior to the reform and when I correct for this trend, it seems like the reform reduced inflow with around 30 percent.

This regression approach is less convenient for the hazard rates describing the outflow probabilities. To assess whether the change in outflow probabilities is stable, it is convenient to map all these probabilities into one single number. I will do so

using the concept of expected duration. Let $h_1 ... h_{22}$ denote the duration categories I used when estimating the hazard rates above, such that $h_1 ... h_{13} = 7$ and $h_{14} ... h_{22} = 30$. λ_t^h is the approximated hazard rates defined in (1.1) of a spell at duration *h* in time *t*. The expected duration of a spell can then be written as in (1.2).

$$E(D_t) \approx h_1 \lambda_t^1 + (h_1 + h_2)(1 - \lambda_t^1)\lambda_t^2 + ... + \left(\sum_{j=1}^{22} h_j \right)(1 - \lambda_t^1)...(1 - \lambda_t^{21})\lambda_t^{22} \qquad (1.2)$$

Intuitively, one can think of (1.2) in the following way: λ^1 is the probability that the spell ends after one week, such that the contribution from the one-week-spells on the expected duration is $h_1 \lambda^1$. $(1 - \lambda^1)\lambda^2$ is the probability that the spell ends during the second week. The contribution from the two-week spells is hence $(1 - \lambda^1)\lambda^2 (h_1 + h_2)$. I then continue in the same fashion up to one year, at which a spell must end. The sum of all these "contributions" is the expected duration.

To distinguish between long-term trends and the more sudden reform effect, I again construct a panel dataset for the years 2002-2006 containing expected duration rates and calendar information. I then regress the quarterly expected durations on a reform dummy combined with yearly dummies, year and quarter dummies, linear and squared time trend and quarterly dummies and a linear time trend. I report only the reform coefficient. All the results are available on request. The results are shown in table 5.

For full-time spells and part-time spells, the estimated effects of the reform are much stronger that what is indicated by the before and after comparison. Expected duration for both full-time and part-time spells falls with around 13 percent. The reform dummy for active sick-leave is non-significant.

Table 5: Robustness check for expected spell duration (outflow from sick-leave)

The effect of the reform on the expected duration of sick-leave spells using various empirical specifications. All equations are estimated using OLS. Coefficients are measured in days.

	Full-time	**Part-time**	**Active**
Year dummies	-4.18	-11.98*	-0.36
Year and quarter	-4.16**	-14.43***	-3.92
Linear and squared time trend	-6.56**	-11.84**	5.21
Linear time trend and quarters	-5.57***	-14.39***	3.46
# obs.	19	19	19

* = p<0.1 , ** = p < 0.05 , *** = p < 0.01

Robustness: timing of reform effects

One major drawback of evaluating reforms that affected all workers at the same time is that effects of other events wrongly may be interpreted as the effect of the reform. I will investigate whether this is the case by an approach inspired by the use of *placebo regressions*. I use the time-series of incidence rates and expected durations used above, and regress these on a linear trend, a set of monthly dummies (only for incidence rates) and a "placebo-reform-dummy" taking the value of zero up to the time of the placebo-reform, and one thereafter. I repeat this regression, pretending that the reform took place at different points in time. In figure 7 I plot the estimated coefficients (and 95 percent confidence interval) for these fictional reforms over time. By construction the placebo-reforms will be contaminated by the true reform effect. Hence, what happens outside the true reform is hard to interpret directly. However, this exercise serves as a test for whether the effect of the reform occurred at the right time.

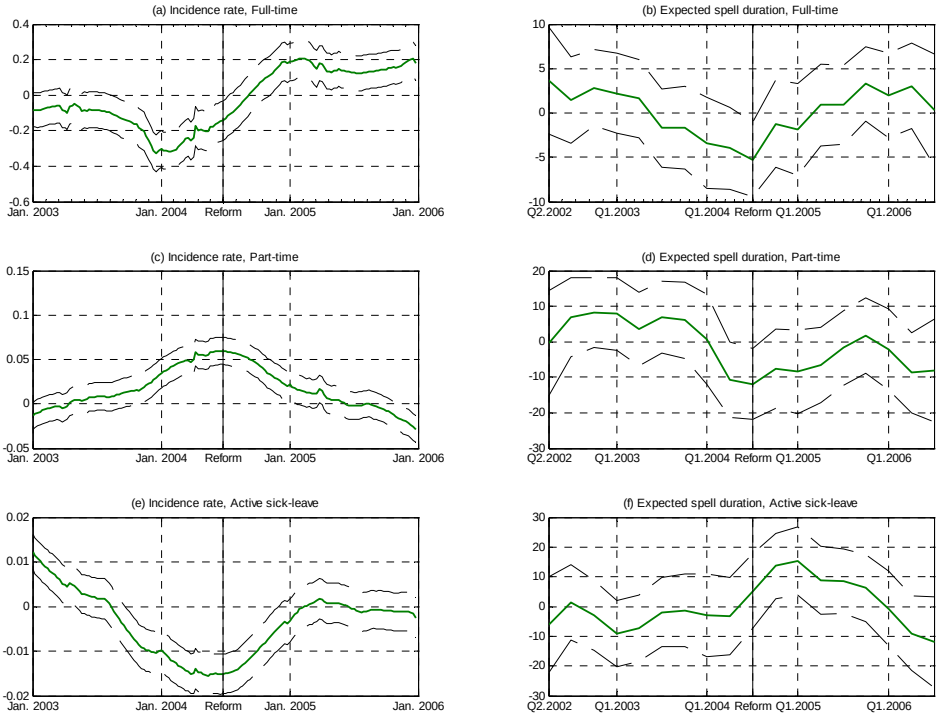

Figure 7: Timing of reform effects

Consider panel (c) above, describing the effect on the incidence rate to part-time sick-leave. The reform intended to increase inflow to part-time sick-leave. Panel (c) confirms that the effect on inflow were the highest at the time of reform. This is reassuring in the sense that it seems probable that it actually was the reform and not something else that affected the incidence rate.

Panels (b), (c), (d) and (e) confirm that the effect of the reform came at the "right" time – i.e. that the estimated reform effect is at its largest when I use the correct date for reform implementation. Expected duration of active sick-leave spells are if anything increasing, but the preceding analysis has shown that there was no significant effect on these spells. Contrary to the other panels, panel (a) shows that the incidence rate to full-time spells actually fell the most prior to the reform with the "effect" peaking in the beginning of 2004. Consequently, I can not argue convincingly that any of the formal reform elements, established from July 1st 2004, is the reason

for the drop in inflow to full-time sick-leave. This is perhaps unsurprising, as there are none of the reform elements that are targeted towards a reduction in inflow to full-time sick-leave.

Based on this, the evidence for a reform effect on inflow to full-time sick-leave are weak. One way to interpret this is that the increased media attention on increasing sick-leave, starting around January 2004, is the true source for the reduced inflow –and not the (formal) reform itself. Whether these speculations are correct is however hard to verify. Interestingly, the preceding analysis shows that (part of) the reduction – whatever its cause – was to a large extent permanent.

5. Decomposition of the reform effects

It can be hard to immediately see the quantitative importance of the changes in duration and incidence rates. To simplify the interpretation I will do a simple calculation exercise. As a rough measure of sick-leave, I use the incidence rate multiplied with the expected spell duration. The results are shown in table 6. I have chosen to include the effects on inflow to full-time sick-leave, despite the fact that the main part of this effect seems to have occurred several months prior to the reform launch. This is because I do believe that the extra public attention starting spring 2004 should be interpreted as part of the reform. One should however keep in mind that the effect on inflow to full-time sick-leave is particularly uncertain.

Table 6: A quantitative exercise

The quantitative importance of each of the reform effects is illustrated. The incidence rate is measured per 100 workers. The sick-leave rate is simply the incidence rate multiplied with expected duration.

Before reform	**Full-time**	**Part-time**	**Active sick-leave**	**Total**
Incidence rate	.1647	.015	.0044	.1841
Expected Duration	38.47	99.97	170.26	46.63[11]
Spell intensity[12]	1	0.5	1	0.96
Predicted sick-leave rate	6.336	.750	.749	7.835
Reform effect				
Incidence rate	-.016	.005	-.0013	
Expected. Duration	-5	-14	0	
Change (PP)	-1.36	.11	-.22	-1.47
Change (%)	-21.4%	14.7%	-29.5%	-18.8%

PARTIAL CONTRIBUTIONS

This table shows the share of the total reform effect of -18.8 percent reduction in sick-leave that can be contributed to changes in incidence rate and expected spell duration within each sick-leave type.

	Full-time	Part-time	Active sick-leave	Total
Incidence rate	.39	-.16	.15	.38
Spell duration	.53	.08	0	.62
Total	.92	-.07	.15	1

The exercise provides a fairly clear picture. First, the changes for full-time spells are by far the most important, accounting for 92.4 percent of the total reform effect. Second, the reduction in active sick-leave is roughly twice the increase in part-time sick-leave. However, this is under the assumption that workers on active sick-leave are inactive. If they worked, on average, half time, the two effects cancel each

[11] Weighted average, incidence rates are weights (same for intensity)

[12] For full-time spells, spell-intensity equals one by definition. For part-time spells, half-time (intensity = 0.5) is the dominant type. The intensity of active sick-leave spells are 1 in the sense that the social insurance agency pays the full wage. However, as these workers are meant to do some work, the reduction in labor supply is not 1 to 1. I have done some calculations, by comparing labor force surveys (where workers are asked whether they worked or not) to the register data, showing that labor supply among workers on active sick-leave were roughly 50% (half the sick-listed workers worked, or all of them worked half time).

other. Third, changes in incidence rates as well as expected duration (inflow and outflow probabilities) are important, but the change in outflow matters the most, accounting for almost 2/3 of the total reduction in sick-leave.

6. Evaluation

Whom did it affect the most?

In this section I will separate the workers in different groups and see which workers were the most affected. I do this by calculating monthly sick-leave rates in the various sub-groups, and compare the changes within these groups at the time of reform.

The percentage reduction in sick-leave at the time of reform is fairly similar for men and women. The reduction was stronger for workers with compulsory education only than for workers with more education. However, even for workers with college/university education, sick-leave fell by as much as 20 percent. Sick-leave seems to have fallen equally much across different age groups. I compare young (below 35), with middle-aged (35-50) and old workers (above 50), and find that the percentage reductions were virtually the same in all these groups. I also separate the dataset into three groups with various employment statuses. I find that sick-leave fell the most among workers more loosely connected to the labor market, e.g. workers not registered as employed for an entire year. This group is fairly small, counting around 170 000 workers. In this group, sick-leave fell by as much as 30 percent. Also in the largest group, “core workers”, registered as full-time workers the entire year, sick-leave fell by more than 20 percent. Hence, the reform seems to have affected all

groups of workers, and with few exceptions, it seem to have affected all workers equally. The complete results are available on request.

Why did it work?

The results strongly indicate that physicians are important for sick-leave. Physicians do have a say as gatekeepers and their practice style can be affected by policy. A relevant question is still, *why* this seemingly modest reform did have such a great impact. One possible explanation is that physicians became stricter because they feared sanctions from the government. Several public statements from the Ministry of Social Affairs threatened physicians, saying they might loose their right to issue sick-leave if they did not "improve". Seen in retrospect this was probably mostly cheap talk and this was also voiced in the media at the time. I find it hard to believe that physicians really feared loosing the right to issue sick-leave certificates. It is hard to understand why the reform should have such a great impact if the physicians did not want to be "reformed". In my view, one credible explanation is that the reform increased the bargaining power of the physician towards their patients. The reform did not provide the physician with any new tools. Hence, what happened after the reform could – in principle – also have been the case earlier. I believe many physicians were (and are) frustrated with patients demanding sickness-certificates and sometimes "shopping" for lenient physicians. Hence, these physicians could now refer to the reform and tell their patients that "I would like to give you this, but I am afraid I can't", when asked for dubious sickness certificates or to prolong sick-leave for recovered patients. Hence, the pressure laid on physicians may actually have increased their bargaining power towards their patients. This is a variant of "two-level games", used for understanding the role of domestic opinion in international

negotiations (Putnam, 1998). By blaming the reform, physicians could strengthen their gate-keeping role, without being the one to blame.

Still, it is somewhat strange that the quantitatively most important reduction in sick-leave came from full-time spells and not part-time spells/active sick-leave. One explanation could be that part-time sick-leave is less attractive for workers. The physician could now blame the reform and refuse to certify full-time sick-leave when part-time sick-leave was appropriate. Choosing between part-time sick-leave and work, some patients may choose work. Particularly for workers without visible illnesses, it might be uncomfortable showing up at work – seemingly well – and feeling colleagues' suspicion as well as frustration because others have to fulfill their tasks.

7. Conclusion

July 1st 2004, Norwegian authorities launched an apparently minor reform regarding sick-leave policies, changing regulations for physicians' sick-leave certification. These changes emphasized that – if possible – workers with health problems should work part-time and have part-time sick-leave. Physicians were instructed – with help of a new form – to perform an evaluation of "remaining work-capacity" of their patients. Physicians were also asked to reduce the use of an arrangement called "active sick-leave" (AS). AS implied that workers – on full-time sick-leave – could work as much as desired to keep in touch with the labor market.

The reform caused a drop in absenteeism of around 20 percent. There were strong effects on the inflow to sick-leave, as well as a decrease in the expected duration of sick-leave spells. Reduced spell incidence accounts for around 1/3 of the

total effect while the remaining 2/3 were due to reduced spell duration, indicating that physicians managed to get employees back to work faster than before. All groups of workers seem affected by the reform in about the same manner. The part of the reform-effect originating from reduced spell-incidence are hampered with some uncertainty as this effect mainly occurred some months before the reform took place. I believe the reason for this is the increased public attention towards the growth in sick-leave rates, and interpret this is a part of the reform effect.

The results from this reform suggest that physicians do play an important role as gate-keepers, and that their gate-keeping can be affected by public policy. Stronger monitoring makes it possible to maintain more generous sickness compensation without increased moral hazard. Reforms strengthening the bargaining power of the physician, by forcing physicians to carry out medical evaluations and provide part-time sick-leave when appropriate, seems to be a fruitful way of reducing sick-leave in generous welfare systems.

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