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Rehabilitation of mental illness and chronic pain
– the impact on sick leave and health

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Rehabilitation of mental illness and chronic pain – the impact on sick leave and health[a]

by

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Abstract

This paper exploits a government initiative to analyze the effect of cognitive behavioral therapy (CBT) for individuals with mild or moderate mental illness and multi-disciplinary treatment (MDT) for individuals with pain in back and shoulders. We employ a propensity score matching approach to study the effects on sick leave, health care consumption and drug prescriptions. We find that CBT improved health and prevented sick leave for individuals who were not on sick leave when treatment was initiated but had no effect for individuals who were on sick leave when the treatment was initiated. MDT was a failure regardless of the individual's sick leave status at the time of treatment. MDT increased sick leave while having no long term impact on either health care visits or drug prescriptions.

Keywords: Mental diseases, chronic pain, sick leave, propensity score matching
JEL-codes: H43, I13, J22

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1 Introduction

Sickness and disability benefits expenditures are substantial in many countries. In 2007, the average OECD country spent 1.9 percent of GDP on sickness and disability benefits, or about 10 percent of public social spending (OECD, 2010). This was almost three times as much as the average cost for unemployment. Two of the most common causes of work absence due to illness, what we denote as sick leave, are mental and chronic pain diseases. About 20 percent of the population in an average OECD country suffers from mental illness at any point in time and up to 50 percent experiences mental illness at some point during their life (OECD, 2012). Similarly, about 19 percent of adult Europeans suffer from chronic pain of moderate to severe intensity (Breivik et al, 2006). These diseases severely affect the quality of social and working lives of individuals. The costs to society are also large, not only covering the direct costs to the health care system but also indirect costs such as decreased productivity and public benefit payments. Tackling mental health problems and chronic pain is a key challenge for modern society.

An important question is what types of treatment can be effective not only in improving health but also in facilitating employment for individuals with mental illness or chronic pain. For labor market outcomes in particular, the evidence remains scarce. There are studies suggesting that psychological treatments, in particular cognitive behavioral therapy (CBT), lead to symptom improvements for anxiety and depression (see, e.g., the review by The Swedish Council on Health Technology Assessment (SBU, 2004)). In a survey of studies on interventions to improve occupational health in depressed people, however, Nieuwenhuijsen et al. (2008) conclude that that there is no evidence that medication alone or enhanced primary care reduces work disability in depressed workers, and that there is no evidence for or against the effectiveness of psychological interventions in terms of work disability.

The Swedish Council on Health Technology Assessment (SBU, 2006 and 2010) and Scascighini et al (2008) survey the literature on methods for treatment of chronic pain. Existing evidence suggests that multidisciplinary treatment, including a combination of psychological interventions and physical training, facilitates return to work, decreases sick leave and improves self-assessed health. However, the most recent survey (SBU, 2010) does not provide support for multidisciplinary treatment decreasing pain

intensity, activity capacity or other symptoms compared to less intensive measures or no measures at all. SBU (2006 and 2010) also conclude that behavioral medical treatment leads to better activity capacity than physical measures without behavioral components, and that acupuncture leads to no difference in pain intensity compared to control methods with other types of stimulation.

Another question is at what stage during the course of the disease treatment is most effective. Despite the fact that mild or moderate mental illness is far more common than severe mental disorders, accounting for as much as three quarters of mental disorders (OECD, 2012), the bulk of the research concerns the latter group. According to OECD (2012), evidence suggests that the effectiveness of drug treatments for mental illness increases with illness severity, whereas psychotherapy may be more effective to treat milder mental disorders. It is also recognized that symptom improvements do not necessarily translate into improved employment outcomes. Mild or moderate mental disorders as well as pain-related diseases may eventually turn into severe disorders if no treatment is provided. In terms of employment outcomes, individuals may also benefit more from treatment at an earlier stage of the sickness episode when the attachment to the workplace is still strong. Johansson et al. (2011) find that vocational rehabilitation is most effective if provided at the workplace.

The contribution of the paper is to study the effects of cognitive behavioral therapy (CBT) for mental illness and multidisciplinary treatment (MDT) for chronic pain not only on health related outcomes such as health care consumption and drug prescriptions, but also on outcomes related to the return to work, namely sick leave. The analysis also sheds light on treatment effectiveness at different stages of the sickness episode. To identify these effects, we exploit a government initiative (*the medical rehabilitation guarantee*) in Sweden. From a public economics perspective, it is crucial to investigate whether different types of initiatives aimed at improving labor market outcomes of individuals at risk of becoming ill are worthwhile to pursue. Since the two types of treatment are targeted at different diagnosis groups, we do not per se make a comparison between treatments. However, since the two types of treatment concern the two main causes of work absence and the medical rehabilitation guarantee affected both in a similar manner it is interesting to consider both treatments in the same paper.

We focus on the treatments in Skåne, a region in the south of Sweden. The reason for restricting the analysis to the Skåne region is the availability of detailed individual health data together with information on certified CBT and MDT clinics. The introduction of the medical rehabilitation guarantee can be shown to cause an asymmetric and gradual expansion of these treatments in the Skåne region. This implies that individuals with similar potential to benefit from treatment to varying degrees were exposed to treatment across time and residence, which means that individuals with the same health status differ in their probability of being treated. In addition of explaining why there is a common support in the selection of observables estimator used in the evaluation the gradual and asymmetric expansion is used as an instrument to test the validity of the maintained condition independence assumption (cf. de Luna & Johansson, 2014). Estimation is performed using propensity score matching, and we analyze the effects for up to two years after treatment. To study the benefits of CBT and MDT at different stages of the sickness episode, the analysis is performed separately for individuals receiving treatments before entering sick leave and when on sick leave. We also provide rough calculations of the public finance implications up to two years after the initiation of treatment.

The results show that CBT improved health and prevented sick leave for individuals who were not on sick leave at the start of treatment but had no effect for individuals who were on sick leave. The results thus suggest that CBT is most effective as a preventive measure. MDT was a failure regardless of the individual's sick leave status at the time of treatment initiation. MDT increased sick leave while having no long term impact on either health care visits or drug prescriptions. The public finance calculations suggest that the CBT was cost effective as a preventive measure, but did not compensate for the large costs of the ineffective MDT.

The paper proceeds as follows. Section 2 provides the background about the government initiative and the induced supply of CBT in the Skåne region. Section 3 outlines the estimation strategy and the data. Section 4 presents the results and Section 5 concludes the paper.

2 Institutional background

2.1 The medical rehabilitation guarantee

In 2008, the Swedish government launched a medical rehabilitation guarantee, containing additional funding to the county councils for evidence based treatments of mental illness and pain in back and shoulders. Mental disorders and musculoskeletal diseases each accounted for about 30 percent of the total sick leave costs in Sweden by the time the program was introduced, and the purpose was both to prevent sick leave and to promote return to work for individuals on sick leave with these diagnoses. The treatments qualifying for additional funding include CBT for individuals with mental illness and MDT for individuals with pain in back and shoulders.[1] The diagnoses qualifying for treatment within the medical rehabilitation guarantee are listed in Appendix A. Since the target groups differ, the treatments are not substitutes for each other, and the evaluation does not concern the relative merits of the two types. However, the fact that the treatments are targeted at the two main causes of work absence and the rehabilitation guarantee affected the supply of the treatments in a similar manner makes them interesting to analyze jointly.

This paper focuses on the medical rehabilitation guarantee in Skåne county council, a council in the south of Sweden which covers 33 of Sweden's 290 municipalities and has a population of about 1.25 million individuals out of about 9.5 million in all of Sweden. To receive compensation for the treatments, clinics had to obtain a contract with the county council in which they proposed offering the treatments with qualified personnel. When the medical rehabilitation guarantee was launched in 2008, there was a lack of personnel with the qualifications needed to provide CBT and MDT. The medical rehabilitation guarantee therefore expanded gradually. Initially, clinics who already had the qualifications to provide the rehabilitation measures received the contracts. Education programs and other efforts to increase the number of certified personnel resulted in an expansion of certified clinics over time. Figure B1 and Figure B2 in Appendix B show the number of clinics with a contract to provide CBT and MDT in the Skåne municipalities on 1 January 2010, 1 January 2011, 1 January 2012 and 30 November 2012. The figures show that the number of contracts varied across municipalities and increased gradually over time.

[1] Also interpersonal therapy qualified for compensation but this type of treatment was very rare. To the extent that it does appear, it will be included with CBT in the analysis.

The assessment of whether the individual qualified for CBT or MDT should be made at the primary care unit where the patient was listed. After that, the patient could choose among the contracted clinics within the entire Skåne county.

2.2 CBT and MDT

The purpose of CBT is to affect thoughts, feelings and behavior in a positive direction, by combining behavioral and cognitive therapy. Individuals learn to recognize difficult situations and to identify and implement an acceptable response. There are several different methods and the boundaries are not precise, but strategies with exercises and home assignments are important components (Swedish Government and Swedish Association of Local Authorities and Regions, 2011).

The medical rehabilitation guarantee for CBT implied availability in two steps. First, a medical evaluation and a structured psychological assessment should be performed by qualified personnel, resulting in a diagnosis giving a picture of the syndrome, the personality and the functioning in relation to work. After an initial assessment, individuals with mild or moderate mental illness should be offered CBT individually or in groups. The number of treatment sessions is individualised, but a treatment sequence should in general contain 10–15 sessions.

MDT has been developed for treating individuals with lasting pain and relatively severe and complex rehabilitation needs. There is no description of the exact structure of an MDT sequence, but a number of factors should be included. The first is a bio-psychosocial approach, which implies that medical, psychological and social conditions, as well as environment and personality, are regarded as contributing to the individual's pain experiences and responses in a complex and integrated way. The second factor is a high intensity of treatment with activities 2–3 days per week over a period of 6–8 weeks. The third factor is well planned and synchronised measures, containing a psychological approach, physical training with increasing intensity, education about pain, its consequences and coping strategies, tasks that strengthen the individual's decisiveness and accountability, and strategies for return to work, e.g., through contacts with the work place. Multidisciplinary treatment is often group based with 6–10 patients, with individual additions when necessary (Swedish Government and Swedish Association of Local Authorities and Regions, 2011).

For CBT, the personnel must include a qualified psychologist or psychotherapist with CBT competence or a nurse, social welfare officer, physiotherapist or physician with supplementary education within CBT. For MDT, the personnel must include at least three different competences, including one physician and one qualified psychologist or psychotherapist with CBT competence or a nurse, social welfare officer, physiotherapist or physician with supplementary education within CBT. [2]

Table 1. Description of treatment

	CBT patients		MDT patients	
	Not on sick leave	On sick leave	Not on sick leave	On sick leave
Treatment period, days				
Mean	151	155	194	144
(standard error)	(99)	(102)	(216)	(130)
Median	128	129	122	105
Number of visits				
Mean	9	10	22	22
(standard error)	(4)	(4)	(11)	(9)
Median	9	9	18	20
Treatment category, percent				
Physician	1	1	17	15
Nurse	1	2	3	3
Physiotherapist	3	2	51	55
Occupational therapist	0	1	8	11
Chiropractor	0	0	7	3
Social worker	15	18	5	4
Psychologist	57	55	7	7
Psychotherapist	16	15	1	1
Other	8	8	1	1
Type of treatment, percent				
Systematic psychological treatment, cognitive	31	31	0	0
Systematic psychological treatment, cognitive-behavioral therapy	59	57	0	0
Group treatment from manual method	3	3	1	1
Team rehabilitation	0	0	29	38
Rehabilitation according to rehabilitation plan	2	3	59	50
Other	6	6	11	11
Observations	42,294	10,207	18,363	9,021

Source: Skåne county council care database.

Table 1 presents descriptive statistics of the treatments for the participants included in the analysis. For CBT, the median treatment period was almost 130 days and the median number of visits during this period was 9. Almost 60 percent of the sessions

[2] It is possible that individuals in the control group received CBT or MDT outside of the medical rehabilitation guarantee at clinics who did not obtain a contract with the county council. Unfortunately, we cannot observe this in the data. The county council was eager to induce the supply of treatment in order to receive the additional funding from the government, however, clinics with qualified personnel should be able to receive a contract and the vast majority of CBT and MDT should be performed within the medical rehabilitation guarantee. To the extent that the alternative treatment is CBT or MDT provided outside of the medical rehabilitation guarantee, this would attenuate the estimated effects of treatment.

were handled by a psychologist, 15 percent by a social worker and 16 percent by a psychotherapist. For MDT, the median treatment period was shorter than for CBT, at 122 or 105 days depending on sick leave status. However, the treatment was much more intense than the CBT, with a median of almost 20 visits during a treatment sequence. About half of these sessions were handled by a physiotherapist, about 15 percent by a physician and about 10 percent by an occupational therapist.

3 Data and empirical strategy

3.1 Data

We use data from the health care data bases in the Skåne county council, which contains detailed individual level information about all health care visits in the county from 1 January 2008 to 31 August 2013. We have also added information about drug prescriptions from the National Board of Health and Welfare from 1 January 2008 to 31 August 2013. From the Social Insurance Agency, we have further collected information about all sickness and disability benefit spells from 1 January 2000 to 31 August 2013,[3] along with a large set of individual characteristics such as age, education, marital status, employment status, earnings and municipality of residence. In all, we have rich information on matters closely related to the individuals' health and labor market position, factors that should be important analyzing future sickness absence, health care and drug consumption.

The population of interest is individuals aged between 20 and 64 who had a registered health care visit with a mental illness diagnosis that could qualify for CBT or a pain-related diagnosis that could qualify for MDT within the medical rehabilitation guarantee between 1 January 2010 and 30 June 2011 or between 1 January and 31 December 2012. [4,5,6] In total 21 percent of the individuals in the target population for CBT received CBT within the medical rehabilitation guarantee at some point during this period, and 3 percent of the target population for MDT received MDT. Given that the

[3] This only includes sickness spells longer than the employer period, which is two weeks.
[4] Since the supply of CBT expanded gradually, few patients received CBT or MDT in the fall 2009 and the exclusion of these patients does not affect the results. Analyzing the impact of CBT, health care visits where the patient has more than 10 previous health care visits with a mental illness diagnosis were eliminated from the beginning, to increase comparability between the groups already before the matching.
[5] The sample is a combination of the samples used in Hägglund et al (2012) and Hägglund et al (2014). Therefore, there is a gap in the sampling of individuals during the second half of 2011.
[6] See Appendix A for a list of the diagnoses and ICD codes.

shares are not higher, this may be due to a diagnosis not detailing a patient's suitability to receive treatment, or to demand exceeding the supply of treatment.

Unfortunately, there is no information about employment status at the time of the health care visit, unless for unemployed[7] individuals who were registered at the Public Employment Service. When patients registered for the medical rehabilitation guarantee, they were asked about their sources of income. Among those who were not reported as unemployed, 75 percent were working. The percentage was somewhat higher among those on sick leave (90%) compared to those not on sick leave (74%). Thus the vast majority of those not unemployed at the start of treatment are working. Since these data are only available for treated individuals it cannot be used in the analyses. However, using the information on current unemployment status and also on employment status in November of each year, we manage to capture employment status fairly well in the estimations.

Table 2. Descriptive statistics of health care visits by treatment status for the target population

	CBT			MDT		
	Treated	Untreated	t-value	Treated	Untreated	t-value
Male	0.30	0.34	– 9.78	0.25	0.41	– 20.39
	(0.46)	(0.47)		(0.43)	(0.49)	
Age	39.69	41.91	– 21.91	45.57	45.13	2.31
	(11.78)	(11.74)		(10.29)	(11.81)	
Foreign born	0.14	0.24	– 34.79	0.27	0.29	– 2.37
	(0.34)	(0.43)		(0.45)	(0.46)	
College	0.50	0.34	36.33	0.28	0.29	– 1.30
	(0.50)	(0.48)		(0.45)	(0.45)	
On sick leave	0.18	0.26	– 21.08	0.32	0.20	10.35
	(0.39)	(0.44)		(0.47)	(0.40)	
Unemployed	0.17	0.24	– 20.47	0.30	0.21	10.35
	(0.38)	(0.43)		(0.46)	(0.41)	
Disability benefits	0.06	0.17	– 51.86	0.19	0.15	6.56
	(0.25)	(0.39)		(0.39)	(0.35)	
Outpatient care visits since 2008						
Total	47.42	86.19	– 77.10	83.47	63.37	16.11
	(48.35)	(126.10)		(67.81)	(69.20)	
Doctor's visits	23.26	30.10	– 35.05	36.67	28.08	17.46
	(21.96)	(29.71)		(26.70)	(29.80)	
Mental illness diagnosis	1.79	24.74	– 100.24	1.40	0.77	4.47
	(3.51)	(93.64)		(7.75)	(5.49)	
Pain-related diagnosis	0.66	0.98	– 14.22	4.16	4.67	– 4.44
	(2.52)	(3.00)		(6.25)	(8.53)	
Value of drug prescriptions since 2008	17 731	26 089	– 7.01	24 515	21 292	3.01
	(141 279)	(101 465)		(58 005)	(76 740)	
Number of sick leave days last 3 years	56.61	109.61	– 40.71	168.17	81.84	18.27
	(143.64)	(221.82)		(257.68)	(186.11)	
Observations	14 683	169 905		2992	242 218	

Note: Standard deviations in parentheses. t-value for the difference in means, absolute values above 1.96 indicates a statistically significant difference at the 5 percent level.

[7] Unemployed individuals have the right to be on sick leave in Sweden.

Table 2 presents descriptive statistics of the health care visits of the target population by treatment status, separately for individuals who were not on sick leave and individuals who were on sick leave at the time of the health care visit. The treatment group consists of the first health care visit of a CBT or MDT sequence within the medical rehabilitation guarantee and the control group consists of all health care visits with a mental illness diagnosis or a pain-related diagnosis, respectively, who were not part of the medical rehabilitation guarantee.

Table 2 shows that selection into CBT was fairly systematic, targeting healthier individuals with higher education and a better labor market situation than the population in general. The number of health care visits is much lower for treated individuals, as well as the value of previous drug prescriptions. Treated individuals are also unemployed and on sick leave to a lower extent than those not selected. Foreign born are underrepresented and college educated are overrepresented among the treated CBT patients compared to those not treated.

MDT, on the other hand, targeted individuals with a relatively weaker labor market situation than the target population in general: the fractions of unemployed and on sick leave are higher and the number of previous health care visits and drug prescriptions are markedly higher. Women are overrepresented for both CBT and MDT, but particularly in the latter group.

3.2 Estimation

To evaluate the effects of CBT and MDT, we use the 'nearest neighbour' propensity score matching in the estimation of the average treatment effect of being treated (ATET). This method can be expected to work well in this setting for two reasons. First, we have access to detailed health data at the individual level and a large number of potential comparison individuals, which should enable us to find good matches between individuals. Second, there is some randomness in the probability of receiving treatment due to the gradual expansion of CBT and MDT across the Skåne county council, described in Section 2.1. This implies that patients with similar potential to benefit from treatment to varying degrees were exposed to treatment because of where they resided.

Specifically, let T define the treatment (CBT or MDT) where T =1 implies that the individual is treated while T =0 imply that they are not. Furthermore let $Y(0)$ be the (potential) outcome in the absence of treatment, $Y(1)$ the (potential) outcome if given

the treatment and let **X** be the set of pre-treatment covariates. Assume, first that the potential outcome of the individuals are not affected by the treatment given to other individuals.[8] Then the ATET is identified if:

$$T \perp Y(0) | X$$
$$\Pr(T = 1|X) < 1 \quad (1)$$

That is, the distribution of the potential outcomes in the absence of treatment should be independent of the treatment conditional on **X** and there should exist comparison individual to the treated for all **X**, that is there should be a common support. We have available a rich set of covariates measuring the patient's current health status (e.g. previous health care visits, drug prescriptions, previous sick leave, diagnosis) and labor market status. In addition we have access to detailed individual information about socioeconomic and demographic variables. Given the rich set of covariates, a concern would be that there might not be common support for the given set. However due to the rapid and unequal expansion across the region there is a logical reason to have common support conditional on the set of **X**. This assumption can furthermore be validated in our data. Validation of the first assumption is given in the next section.

Using logistic regression, we estimate the probability of receiving CBT and MDT, which is the estimated propensity score. For each health care visit in which an individual begins to receive CBT or MDT within the medical rehabilitation guarantee, we identify a health care visit for an untreated comparison with the same probability to receive treatment.[9] An important aspect with nonparametric estimators is that they have asymptotically nonignorable bias with many covariates (e.g., Abadie & Imbens, 2006). It is thus essential to work with as few covariates as possible. Given that there is no apparent and clear theory for which covariates should be considered as more important than others, the matching approach is implemented using a sequential design. The sequential design implies that we include variables as long as the mean absolute standardized value between the treated and controls of any covariate is larger than 0.25, which is the rule of thumb suggested in Wooldridge and Imbens (2009).[10] The

[8] This is the stable-unit-treatment-value assumption; see, e.g., Rubin (1990).
[9] The same health care visit is allowed to be selected as comparison for several of the treated. In most instances, a health care visit is equivalent to a patient, but using health care visit instead of patient as the observation entity increases the possibilities of finding a relevant comparison group. A treated individual is however not allowed to be matched to his or her self before treatment.
[10] Note that standard statistical t-tests would be too restrictive, as 5 out of 100 covariates would be statistically different by chance.

sequential design starts by adding the health variables, then the labor market status variables and finally the socioeconomic and demographic variables. The models are fitted with a maximum of second order interaction term, however no interaction terms were seen necessary as they were not statistically significant in the logistic regression.

An important purpose of the paper is to investigate whether treatment efficiency depends on stage of the sickness episode. Therefore, all analyses are performed separately for individuals who were, and were not, on sick leave at the start of treatment. To capture dynamics, we estimate the effects separately for each quarter since treatment was initiated. General calendar time aspects are taken into account by always including the month of the health care visit as a matching variable. The analysis captures the effect of CBT and MDT within the medical rehabilitation guarantee compared to ordinary treatment. The ordinary treatment will be described only at a general level, by the comparison of the outcome variables between the treated and the untreated groups.

Table C1–Table C4 in Appendix C show the estimates from the final estimated regression models for CBT and MDT and the two sick leave states at potential initiation of the treatment, respectively. Due to the sequential procedure, the estimated regression models differ across the four groups, which suggest that the selection to treatment was different. Table 3 presents descriptive statistics for the matched samples. After the matching, the characteristics of treated and untreated individuals are very similar, not only with respect to the variables included in the regression models, but also with respect to variables that were not included. This increases the credibility of the matching strategy. Note, for example, in Table 3 that the history of sick leave is not included in the matching model for CBT treated individuals who were not on sick leave when treatment was initiated, but still is balanced across the matched samples.

Finally, Figure C1–Figure C4 in Appendix C displays the distribution of the estimated propensity scores for each treatment and comparison group. From these figures we can see that the common support assumption is supported despite the very detailed health information in our data.

Table 3. Descriptive statistics of health care visits by treatment status for the matched CBT and MDT samples

	CBT				MDT			
	Not on sick leave		On sick leave		Not on sick leave		On sick leave	
	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated
Male	0.32 (0.47)	0.32 (0.47)	0.26 (0.44)	0.25 (0.43)	**0.27 (0.45)**	**0.24 (0.43)**	0.27 (0.45)	0.27 (0.44)
Married	0.33 (0.47)	0.33 (0.47)	0.44 (0.50)	0.42 (0.49)	0.48 (0.50)	0.51 (0.50)	0.47 (0.50)	0.47 (0.50)
Age	37.73 (11.41)	37.76 (11.41)	42.99 (10.58)	42.55 (10.38)	43.57 (10.57)	43.89 (10.23)	44.79 (9.76)	44.74 (9.90)
Foreign born	0.14 (0.34)	0.13 (0.34)	0.13 (0.33)	0.13 (0.34)	0.28 (0.45)	0.28 (0.45)	0.28 (0.45)	0.30 (0.46)
Earnings (SEK 1,000)	223.3 (165.5)	229.4 (310.2)	275.2 (118.5)	274.0 (131.0)	205.0 (149.6)	208.1 (155.6)	240.0 (98.6)	237.7 (90.9)
College	0.53 (0.50)	0.53 (0.50)	0.48 (0.50)	0.48 (0.50)	0.32 (0.47)	0.33 (0.47)	0.24 (0.43)	0.23 (0.42)
Unemployed	**0.17 (0.37)**	**0.16 (0.36)**	0.14 (0.34)	0.13 (0.33)	0.29 (0.45)	0.30 (0.46)	0.25 (0.43)	0.23 (0.42)
Number of prescriptions, since 2008	34.82 (46.04)	35.14 (45.45)	54.16 (72.01)	55.95 (79.25)	61.68 (72.26)	64.06 (101.0)	76.78 (97.65)	74.35 (85.17)
Specialist care visits, since 2008	12.98 (19.30)	12.61 (24.55)	20.01 (28.47)	19.20 (37.74)	19.70 (26.46)	19.23 (29.94)	**25.75 (34.41)**	**31.02 (38.86)**
Primary care visits, since 2008	26.53 (25.21)	26.54 (24.92)	36.68 (36.01)	35.51 (32.27)	48.58 (40.80)	48.09 (49.38)	65.93 (48.14)	63.04 (48.38)
Inpatient care days, since 2008	1.15 (5.62)	1.23 (6.67)	3.39 (15.29)	3.61 (14.91)	1.62 (6.40)	1.92 (6.10)	3.45 (14.98)	3.34 (9.24)
Doctor visits, since 2008	19.25 (16.54)	19.00 (17.77)	28.64 (24.47)	28.71 (32.98)	30.99 (23.05)	30.50 (28.85)	40.24 (26.56)	41.42 (31.53)
Total care visits, since 2008	39.13 (36.32)	38.78 (39.14)	56.00 (52.50)	53.95 (53.44)	67.73 (54.34)	66.70 (65.05)	90.92 (64.66)	93.17 (69.20)
Care visits, mental illness diagnosis, since 2008	1.28 (1.79)	1.28 (1.74)	1.91 (2.18)	2.00 (2.02)	2.89 (3.70)	2.74 (3.61)	5.49 (7.38)	5.39 (6.59)
Sick leave days, quarter -1	1.87 (9.08)	1.65 (8.47)	46.07 (30.79)	46.31 (32.12)	3.16 (11.59)	3.69 (13.68)	68.04 (28.45)	68.78 (29.11)
Sick leave days, quarter -2	1.90 (10.39)	1.74 (9.74)	18.60 (31.88)	20.33 (33.46)	5.44 (18.46)	5.41 (18.64)	47.86 (38.90)	49.00 (39.19)
Sick leave days, quarter -3	1.94 (10.73)	1.69 (10.06)	12.41 (28.04)	13.29 (28.52)	6.75 (21.07)	5.51 (19.17)	35.71 (39.06)	35.47 (38.56)
Sick leave days, quarter -4	1.87 (10.64)	1.91 (10.88)	10.42 (25.94)	10.80 (26.33)	7.01 (21.58)	6.39 (20.77)	28.76 (37.60)	28.99 (38.21)
Sick leave days, last 3 years	25.76 (88.82)	25.80 (94.39)	150.29 (208.26)	161.27 (223.13)	83.97 (193.66)	75.76 (187.55)	354.38 (295.72)	359.73 (307.24)
Observations	10,824	10,824	2,527	2,527	1,428	1,428	788	788

Note: Standard deviations in parentheses. Bold marks statistically significant difference between treated and untreated at the 5 percent level.

4 Results

4.1 Main results

Table 4 presents the matching results (estimates of the ATET and their estimated standard errors[11]) on the effects of CBT and MDT for: i) the number of sick leave days (including days on disability benefits), ii) the number of health care visits, and iii) the

[11] The standard errors are estimated non-parametrically using the nearest neighbor matching estimators of Abadie and Imbens (2006).

number of drug prescriptions, during a follow-up period of up to two years after the initiation of treatment. Since data only includes sickness insurance payments (and not sick pay from the employer), only sick leave episodes longer than 14 days are analyzed. Also including periods of disability benefits suggests that we do not separate between temporary and more permanent sick leave.

Table 4. Matching results of the effects of CBT and MDT during a 2 year follow-up period

	CBT, not on sick leave	CBT, on sick leave	MDT, not on sick leave	MDT, on sick leave
Sick leave days	– 5.6***	0.9	30.4***	72.2***
	(1.0)	(5.8)	(4.8)	(11.6)
Mean of dep. var. in control group	22.7	199.0	36.7	273.6
Health care visits	1.7***	1.4	14.1***	11.9***
	(0.4)	(1.0)	(1.4)	(2.3)
Mean of dep. var. in control group	23.6	37.2	36.2	55.3
Drug prescriptions	– 1.4***	– 2.4***	2.5**	1.9
	(0.3)	(0.9)	(1.2)	(1.8)
Mean of dep. var. in control group	12.2	21.2	21.6	29.0

Note: Standard errors in parentheses. **/*** indicates statistical significance at the 5- and 1-percent level, respectively.

When CBT was given to prevent future sick leave, sick leave was reduced by almost 6 days over the two-year follow-up period, or by about 25 percent compared to the mean in the control group. The number of health care visits increased by 1.7 visits, or by about 7 percent, which partly captures the rehabilitation per se. The number of drug prescriptions was reduced by 1.4, or by about 11 percent compared to the mean in the control group. When CBT was given to individuals already on sick leave, however, there is no significant effect on sick leave or health care visits, but there is a reduction in drug prescriptions.

For MDT, the results are similar independent of the individual's initial sickness absence status. MDT as a prevention increased subsequent sick leave by 30 days or by about 83 percent. The corresponding estimate for MDT among those on sick leave is 72 days or about 26 percent. Also the number of health care visits increased for MDT, regardless of sick leave status at the start of treatment. The increase amounted to 11.9 (14.1) visits, or about 22 (39) percent compared to the mean in the control group of individuals on sick leave (not on sick leave). For MDT-treated on sick leave, there is also a significant increase in drug prescriptions by 2.5 or by about 12 percent compared to the control group.

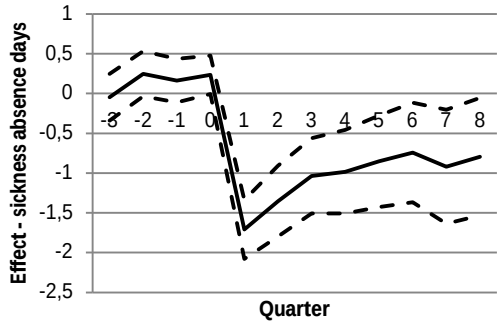
Figure 1 and Figure 2 present the dynamics of the results, from three quarters before to eight quarters after initiation of treatment. The figures show that there were no significant differences in the outcome variables between the treatment and the control group before treatment, increasing the credibility of the matching approach.

For individuals who were not on sick leave when treatment was initiated, Figure 1(a) shows that CBT immediately reduced the number of sick leave days following treatment by about 1.5 days. Even though the difference is decreasing over time, there is still a significant negative effect on sick leave by about 1 day eight quarters after the initiation of treatment. For the same group of individuals, Figure 1(c) shows that the number of outpatient care visits with a mental illness diagnosis increased during the first and second quarter, which likely captures the more intensive CBT compared to alternative treatments. From three quarters onwards, however, there is a significant decline of up to 0.5 visits for the treated compared to the controls that is still significant eight quarters after the initiation of treatment. Figure 1(e) shows that also drug prescriptions were substantially reduced among CBT patients who were not on sick leave when treatment was initiated. Although the drop is most striking during the treatment period, this decrease is significant during the entire eight quarter follow-up period. Overall, the results suggest that CBT as a preventive treatment was successful in terms of reduced sick leave, reduced outpatient care visits and reduced drug prescriptions.

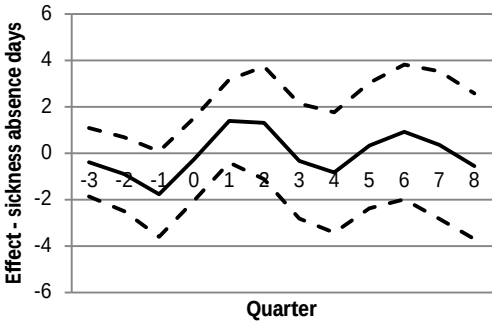
For CBT given to individuals on sick leave, Figure 1(b) shows no significant effects on sick leave. Figure 1(d) shows that CBT increased the number of health care visits in the short term, but had no significant effect from the second quarter and onwards. As for the effect on the number of drug prescriptions, presented in Figure 1(e), there is a significant decline up until the fifth quarter but no effect thereafter.

Figure 2 shows that the MDT, both as a preventive measure and when given to individuals on sick leave, *increased* the number of days on sick leave with 5–10 days per quarter (Figure 2(a) and Figure 2(b)). The effects remain significant, large and positive during the entire eight quarter follow-up period. For the number of health care visits, presented in Figure 2(c) and Figure 2(d), there is a significant and large increase during the treatment period but no impact in the long run. Figure 2(e) and Figure 2(f) show that there is also no significant effect of MDT on the number of drug

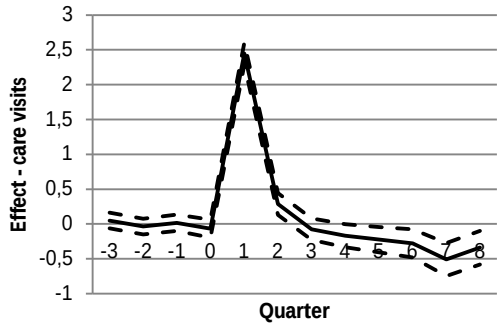
prescriptions. Overall, we find a substantial increase in sick leave following MDT and an initial increase in health care visit, while there are no long term effects on either health care visits or drug prescriptions.



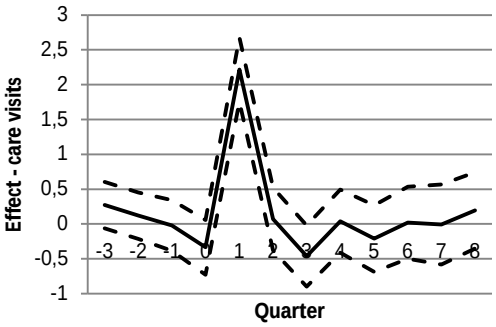
(a) Effect on sick leave days, not on sick leave



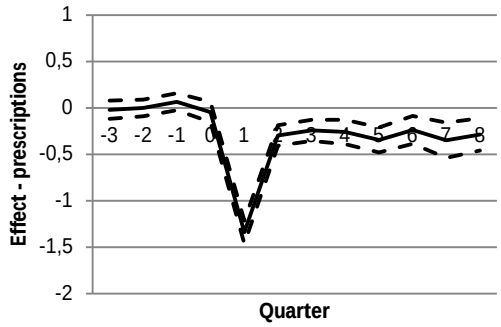
(b) Effect on sick leave days, on sick leave



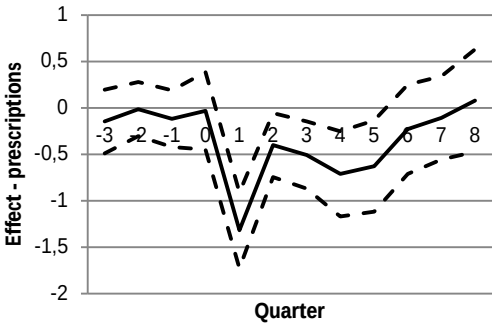
(c) Effect on outpatient care visits with mental illness diagnosis, not on sick leave



(d) Effect on outpatient care visits with mental illness diagnosis, on sick leave

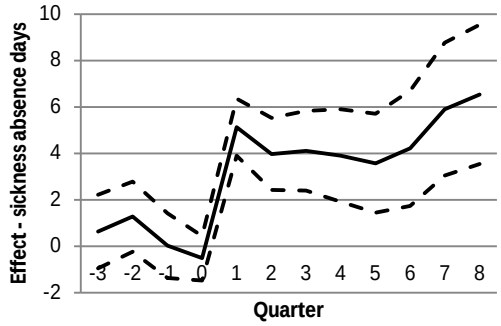


(e) Effect on drug prescriptions, not on sick leave

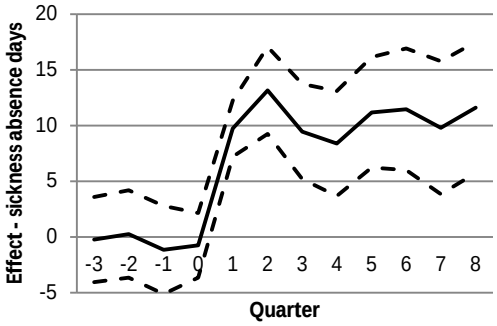


(f) Effect on drug prescriptions, on sick leave

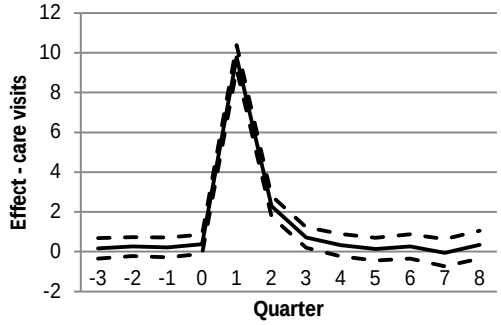
Figure 1. Matching estimates (mean solid line, dashes 95 confidence interval) of the effect of CBT on sick leave days, outpatient care visits with mental illness diagnosis and the number of drug prescriptions, by sick leave status at the initiation of t



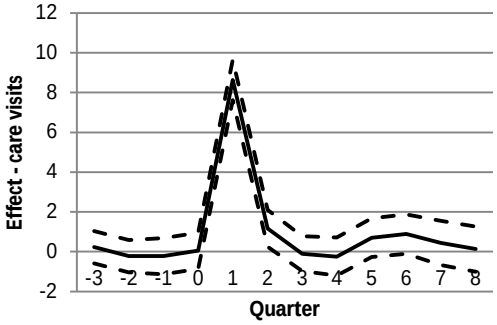
(a) Effect on sick leave days, not on sick leave



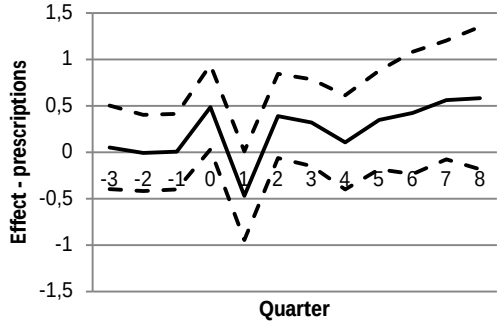
(b) Effect on sick leave days, on sick leave



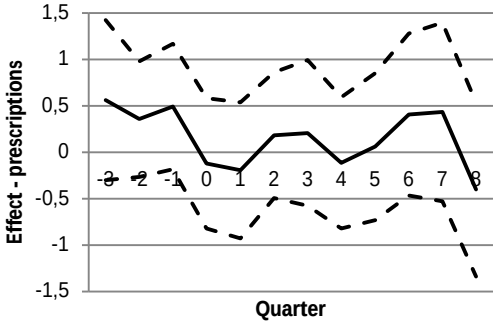
(c) Effect on outpatient care visits with mental illness diagnosis, not on sick leave



(d) Effect on outpatient care visits with mental illness diagnosis, on sick leave



(e) Effect on drug prescriptions, not on sick leave



(f) Effect on drug prescriptions, on sick leave

Figure 2. Matching estimates (mean solid line, dashes 95 confidence interval) of the effect of MDT on sick leave days, outpatient care visits with mental illness diagnosis and the number of drug prescriptions, by sick leave status at the initiation of t

Comparing raw averages of sick leave show that the positive effect of CBT in terms of lower sick leave for individuals not on sick leave are driven by the prevalence not increasing as much for the treatment group as for the control group. The same is true for the number of drug prescriptions among the patients who were already on sick leave when treatment was initiated. For the number of health care visits with a mental illness diagnosis, on the other hand, the effects are driven by the smaller increase in the control group relative to the treatment group. Overall, this suggests that the alternative

treatment to CBT was sick leave and medication. For MDT patients, the pattern is the reverse. The negative effects on sick leave for MDT patients appear to be a consequence of increased sick leave among the treated individuals, rather than a decrease in sick leave among the non-treated.

4.2 Validation of the results

An important starting point in the analysis is that the apparent increase in CBT and MDT from 2009 is not driven by an increased demand for these treatments during the period, but by the introduction of the medical rehabilitation guarantee. Depending on the local conditions in the form of available competence and the ability to quickly expand and provide treatment, randomness has emerged with regards to which patients receive and do not receive treatment. This randomness has, together with the detailed health data from the Skåne county council, implied that individuals with similar health have been identified as matches to the treated individuals. There is, however, always a risk that the analysis does not manage to account for all factors that are important for the treatment as well as for the outcome if not treated. In this particular case, the assessment of the prescribing doctor could, for example, be based on information that cannot be observed in the data.

Some support for the performed analysis being accurate is that expected effects on the number of health care visits and drug prescriptions, i.e., outcome measures that should be directly related to treatment, are found in the short run. If the selection to treatment within the medical rehabilitation guarantee would be based on unobservable characteristics, and the compared groups were in fact not comparable, effects should have appeared gradually and not immediately (see, e.g., Abbring & van den Berg, 2003).

Furthermore, based on observable characteristics (Table 2), we see that selection to MDT was made among patients with relatively weak health status. If unobservable characteristics would have been in the selection to treatment, we would suspect that the negative effects in the form of increased sick leave (primarily in the long run) would not be a consequence of the treatment itself but of the initially weaker health status not properly being taken into account. However, the other variables, capturing health care visits and drug prescriptions, are likely better measures of health status than sick leave. It is therefore interesting that there are no long term impacts on health care visits or drug

prescriptions for patients receiving MDT. This suggests that the treated MDT individuals did not have an initially worse health status than the non-treated.

The opposite reasoning applies to the selection of patients for CBT. According to Table 2, the selection to CBT was made among individuals with relatively better health, i.e., milder mental illness, than those receiving the regular treatment. If unobservable factors would be important in the selection of participants, we would thus expect positive effects throughout. That is also the case among individuals who were not on sick leave at the initiation of treatment. Even if the reasoning about short and long term effects above speaks against unobservable factors having skewed our results, a more formal test should be pursued to ascertain that this is not the case. To this end we use a recent test suggested in de Luna and Johansson (2014), which can be seen as a non-parametric Hausman test. They consider the situations where there exist a variable Z that takes values in T (if not, it may be made dichotomous using a threshold) which fulfils the following assumption:

$$Z \perp Y(0)|X$$
$$\Pr(Z = 1)\,|\boldsymbol{X}) < 1 \qquad (2)$$

That is, the instrument is independent of the potential outcome conditioned on the conditioning set of variables $\boldsymbol{X}$. This means that there should be no effect of Z on Y conditional on T. If both (1) and (2) hold then $T \perp Y(0)|\boldsymbol{X}, Z$ which then furthermore implies[12]

$$(Z, T) \perp Y(0)|\boldsymbol{X}. \qquad (3)$$

The conditional independence assumption (CIA) in (1) is testable from the data when conditioning on $T = 0$. Finding evidence in the data against (3) is then interpreted as evidence against the CIA (1) if (2) is known to hold from subject-matter considerations. For a test based on (3) to have power against (1) we further need to assume the instrument Z is relevant, that is Z and T are dependent conditional on $\mathbf{X}$.

Here we, thus, use the information about the expansion of treatment across municipalities as an instrument. In the test, a treated patient is given the value 1 if the number of contracted clinics in the surrounding area is above the median number, otherwise 0. The intuition behind the test is that if the mean of Y for the matched non-

[12] It does not hold for variables that are stable (or faithful). Stability assumptions are typically implicit in structural models. See de Luna and Johansson (2014) for details.

treated for the two groups, above and below the median, are different then it is likely that unobservable factors have affected the results.

The expansion as the change in the number of contracted clinics was a direct consequence of the rehabilitation guarantee and had no direct connection to the degree of illness in the population in different parts of the Skåne county council. A requirement for the test to be relevant is that the number of contracted clinics in the patient's surroundings matters for the patient's probability to receive treatment conditional on the covariates. The relevance for CBT is shown in column 1 of Table 5. If an individual at the time of the health care visit had relatively many contracted CBT clinics in the surroundings, the probability of receiving treatment increases by 1.2 and 1.0 percentage points for individuals on sick leave and not on sick leave at the initiation of treatment, respectively. This increase is statistically significant and exceeds the limit normally used to test whether the test is relevant (F-value > 12). For the MDT the instrument was unfortunately not relevant which is why we do not present the results from that analysis.

Table 5. Results from test of matching strategy, CBT

	Not on sick leave		**On sick leave**	
	(1) Effect of number of organizers	(2) Chow test	(3) Effect of number of organizers	(4) Chow test
Estimate (Standard error)	0.010 (0.001)		0.012 (0.001)	
F-test (p-value)	234.57 (0.00)	1.87 (0.17)	92.48 (0.00)	0.99 (0.32)

Figure D1 and Figure D2 in Appendix D show the distribution of the Pr(Z=1|**X**,T=0) and Pr(Z=1|**X**,T=1) for the two CBT groups. From the figures we can see that the common support assumption is supported.

The second and the fourth column in Table 5 present the results from the performed test. They show that the assumption that the observable factors used in the matching are enough to identify individuals among non-treated with the same health as the treated cannot be rejected. For individuals not on sick leave it can be seen that it is highly unlikely that there are omitted factors in the matching that would affect both treatment and sick leave and health consumption. In other words, the test supports that the differences in sick leave that are found in the analysis are results of the difference in treatment.

4.3 Public finance implications

Given the above results, a natural question is whether CBT or MDT are motivated policy interventions from a public finance perspective. Table 6 presents rough calculations of the public costs and benefits of the CBT and MDT during the follow-up period of up to two years after initiation of treatment. The analysis accounts for changes in sick leave payments (including sickness and disability benefits); health care visits with a mental illness or pain-related diagnosis, for CBT and MDT respectively; and drug prescriptions. The sick leave costs are estimated directly using data on benefits payments from the Social Insurance Agency. For health care visits with a mental illness or a pain-related diagnosis, we use the estimates for the effect on the number of visits, presented in Table 6, and assign a cost per visit of 1,200 SEK, which is an average cost for different types of visits. Also the costs of drug prescriptions can be estimated directly using the subsidized value of drug prescriptions above what the individual pays out of his/her own pocket.

The public finance calculations should be interpreted with caution. First, the previous analysis suggested that some of the effects may last for more than two years, and a longer follow-up period may therefore give different results. Some individuals are also followed for less than two years, due to data availability, which also affects the results. Second, there may be public costs and benefits that are not included in the calculations. For example, since sickness benefits do not fully compensate for income loss also tax revenues would increase with reduced work absence, partly due to increased income taxes but also due to increased value added taxes if the additional income is used for consumption. Third, potential benefits in terms of increased well-being and improved self-assessed health are also not taken into account. Finally, the productivity at the workplace may be affected by the treatment, even if it does not spill over into sick leave. For all these reasons, the public finance calculations should merely be seen as an indication of the potential impact on public finances.

The first column in Table 6 shows that the decrease in sick leave for CBT individuals who were not on sick leave when treatment was initiated implied a decrease in sick leave payments of about SEK 1,700 per patient during a two year follow-up period. For CBT individuals who were on sick leave, there is an increased cost of about SEK 1,100 per individual during two years. For MDT individuals, the increased work absence following treatment implies a cost of about SEK 12,000 per patient for individuals not

on sick leave when treatment was initiated, and SEK 36,000 for already absent individuals.

The second column in Table 6 shows that rehabilitation increased the number of health care visits with a mental illness or pain-related diagnosis, for CBT and MDT respectively, for all groups. The increase was substantially larger for MDT individuals, however, implying a cost of SEK 14,000–17,000 per individual compared to around SEK 2,000 for CBT individuals. The third column in Table 6 shows a slight decrease in the subsidized value of drug prescriptions for all groups, except for CBT individuals who were on sick leave. The amounts are small, however, compared to the first two columns.

Finally, the fourth column in Table 6 shows that in total, the medical rehabilitation guarantee implies a loss for the state. The positive effects from CBT for individuals who were on sick leave at the initiation of treatment were large enough to compensate for the costs of more health care visits during the treatment period. This was not the case for the other groups. The most negative results from the medical rehabilitation guarantee are for MDT individuals who were already on sick leave at the initiation of treatment. The total cost for this group was SEK 50,000 per individual.

Table 6. Public finance implications, SEK

	Sick leave payments	Outpatient care visits with mental illness or pain-related diagnosis	Subsidized value of drug prescriptions	Public finance implications, total
CBT				
Not on sick leave	– 1,748	2,084	– 341	– 5
On sick leave	1,136	1,706	509	3,351
MDT				
Not on sick leave	12,173	16,938	– 1,088	28,023
On sick leave	35,961	14,321	– 181	50,101

Note: The outcome variables are measured during the year following the initiation of treatment. The public finance implications are the sum of sick leave payments, the outpatient care visits with mental illness diagnosis times an estimated cost per visit of 1,200 SEK, and the subsidized value of drug prescriptions.

4.4 Potential mechanisms

One conclusion from the analysis is that CBT is effective in preventing sick leave and improving long term health outcomes when offered to those not on sick leave, but not effective in reducing sick leave for those already on sick leave. This is in line with previous research showing that vocational rehabilitation measures have better chances at preventing sick leave than increasing return to work among already absent individuals (Johansson et al, 2011).

A second conclusion from the analysis is that MDT is ineffective, and even has adverse effects on sick leave, regardless of sick leave status at the initiation of treatment. In terms of the size of the effects relative to the averages in the control groups, the results are worse for individuals not on sick leave at the initiation of treatment than for those who were already on sick leave.

Anderzén et al (2008) discusses two potential mechanisms in a study where they find that MDT increased sick leave. One is that rehabilitation measures may foster an identity as sick (see, for example, Parsons, 1978; Twaddle & Nordenfeldt, 1994; Sachs, 1987). Another is that participation in treatment may lead to lock-in effects. An intensive treatment may prevent work during the rehabilitation period, and waiting times between treatment sequences may further delay return to work. This may in turn reinforce an identity as being sick and lead to negative effects also in the long run. If the health care provider stresses the importance of full recovery before returning to work, this may also lead to a long term lock-in effect on sick leave. Taylor and Lewis (2008) suggest that the negative effects from "The Job Retention and Rehabilitation Pilot" in Great Britain may be due to such lock-in effects.

A more detailed analysis of the type of sickness insurance (SI) benefits received by treated and non-treated individuals can give further information on whether it was necessary for MDT-treated to be on sick leave during treatment. For an individual on sick leave, the typical benefit type is sickness insurance (SI) benefits. SI benefits can, however, be replaced by rehabilitation benefits if the individual takes part in vocational rehabilitation. A third option is that the doctor prescribes so called 'preventive sick-leave benefits' if, for instance, the doctor prescribes medical rehabilitation or medical treatment in order to reduce the risk of disease that prevents the patient from working.

Figure E1 in Appendix E presents the effect on sick leave, divided into two groups: i) regular SI benefits and, ii) preventive sick-leave benefits or rehabilitation benefits. The results for MDT-treated not on sick leave are shown in Figure E 1(c). From the figure we can see a sharp increase in the use of preventive sick-leave benefits and rehabilitation benefits during the first two quarters, which is being replaced by an increased take-up of regular SI benefits from the third quarter onwards. The results hence support that individuals not on sick leave receiving MDT entered into sick leave

in order to participate in treatment, and that this eventually spilled over into regular sickness benefits.

For individuals on sick leave receiving MDT, presented in Figure E 1(d), the pattern is different. Although there is a steady increase in the use of preventive sick-leave benefits or rehabilitation benefits during the first four quarters, it is the payment of regular SI benefits that causes the immediate increase in sick leave for the treated compared to the non-treated. The negative effect during the first two quarters is hence a result of the treated, because of the treatment, not returning to employment to the same degree as the non-treated. The effect on preventive sick-leave benefits and rehabilitation benefits in the third and fourth quarter indicates that treatment increases the probability of taking part in other, subsequent, rehabilitation measures.

Figure E 1(a) and Figure E 1(b) clearly show that the decrease in sick leave due to CBT, unlike the results for MDT, can be directly linked to the use of regular SI benefits.

In sum, these results support the interpretation that the increased sick leave during MDT is due to the treatment being difficult to combine with, for instance, full time work. MDT thus appears to have had a lock-in effect on sick leave that eventually has become permanent. This may be due to changes in the patient's preferences for work or assessment of own work capacity, or due to weak incentives for the employer to get the individual back to work.

5 Conclusion

Labor market exclusion due to mental illness and chronic pain is a key concern for policy makers around the world. Despite the large number of individuals who suffer from these types of illnesses, the evidence on the effectiveness of different types of treatment is still scarce. In particular, we know little about the impact on employment outcomes. We also know little about when during the course of the disease different types of treatment are most effective.

In this paper, we have studied the impact of CBT for individuals with mild or moderate mental illness and MDT for individuals with pain in back or shoulders on sick leave, health care visits and drug prescriptions. We utilised a government initiative providing additional funding for CBT and MDT that increased the supply of these types of treatment. The analysis focused on the Skåne region in the south of Sweden, due to

the availability of detailed health data, and we employed a propensity score matching approach. To study the impact of CBT and MDT at different stages of the sickness episode, the analysis was performed separately for individuals who were not on sick leave and individuals who were on sick leave when treatment was initiated.

The results suggest that CBT reduced sick leave and drug prescriptions for individuals who were not on sick leave at the initiation of treatment. It initially increased the number of health care visits with a mental illness diagnosis, but this effect was reversed to a reduced number of visits in the long run. For individuals who were on sick leave, we find no reduction in sick leave and no long term decrease in health care visits or drug prescriptions. This indicates that CBT is most effective at an early stage in the sickness episode, as a preventive measure rather than a measure to promote return to work.

For MDT, the results are disappointing irrelevant of sick leave status at treatment initiation, suggesting increased future sick leave and no long term impact on health care visits or drug prescriptions. This result stands partly in contrast to previous studies that give some support for MDT as an effective measure to increase return to work, as summarized by SBU (2010). The studies that this conclusion is based on are largely small-scaled non-blinded experiments where the patient self-reports sick leave and labor supply. Since both the method of analysis and the outcome measures are different from our study, there are several possible reasons for the divergent results.

Public finance calculations suggest that the medial rehabilitation guarantee implied an overall loss for the state. Although the CBT was cost effective as a preventive measure, it did not compensate for the large costs of the ineffective MDT.

An interesting question for further research is the role of treatment at different stages of the sickness episode. The positive effects of CBT for individuals not on sick leave were a result of the alternative treatment, apart from medication, being sick leave. To not put individuals on sick leave during the CBT had positive effects in the form of lower sick leave during as well as after treatment. Likewise, to put MDT patients on sick leave during the treatment period seems to have led to increased absence also in the long run. To combine rehabilitation with work appears to be a good idea to achieve positive results. The results in this paper also give support to the view that rehabilitation measures should be provided early on during the sickness episode, when both working

capacity and the motivation for work are still relatively high and before the individual has become absent from work.

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Appendix A: Diagnoses covered by the medical rehabilitation guarantee

CBT
F32 Depressive episode
F33 Recurrent depressive disorder
F40 Phobic anxiety disorders
F41.0 Panic disorder
F41.1 Generalized anxiety disorder
F41.9 Anxiety disorder, unspecified
F42 Obsessive-compulsive disorder
F43.1 Post-traumatic stress disorder
F43.8 Other reactions to severe stress
F43.9 Reaction to severe stress, unspecified

MDT
M24.5 Contracture of joint
M43.1 Spondylolisthesis
M50.0 Cervical disc disorder with myelopathy
M51.0 Lumbar and other intervertebral disc disorders with myelopathy
M53.0 Cervicocranial syndrome
M53.1 Cervicobrachial syndrome
M53.3 Sacrococcygeal disorders, not elsewhere classified
M54.2 Cervicalgia
M54.3 Sciatica
M54.4 Lumbago with sciatica
M54.5 Low back pain
M54.6 Pain in thoracic spine
M54.9 Dorsalgia, unspecified
M75.0 Adhesive capsulitis of shoulder
M75.1 Rotator cuff syndrome
M75.3 Calcific tendinitis of shoulder
M75.4 Impingement syndrome of shoulder
M75.9 Shoulder lesion, unspecified
M79.0 Rheumatism, unspecified
M79.1 Myalgia
M79.9 Soft tissue disorder, unspecified
R52.0 Pain, not elsewhere classified
T91.8 Sequelae of other specified injuries of neck and trunk

Appendix B: The gradual expansion of the medical rehabilitation guarantee in the Skåne county council

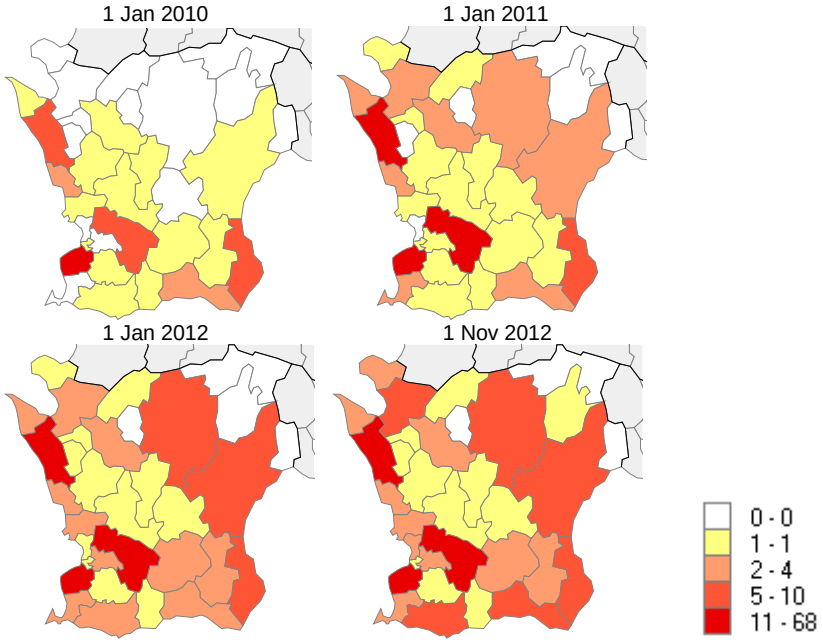


Figure B1. Number of contracted clinics for CBT within the medical rehabilitation guarantee in the Skåne municipalities

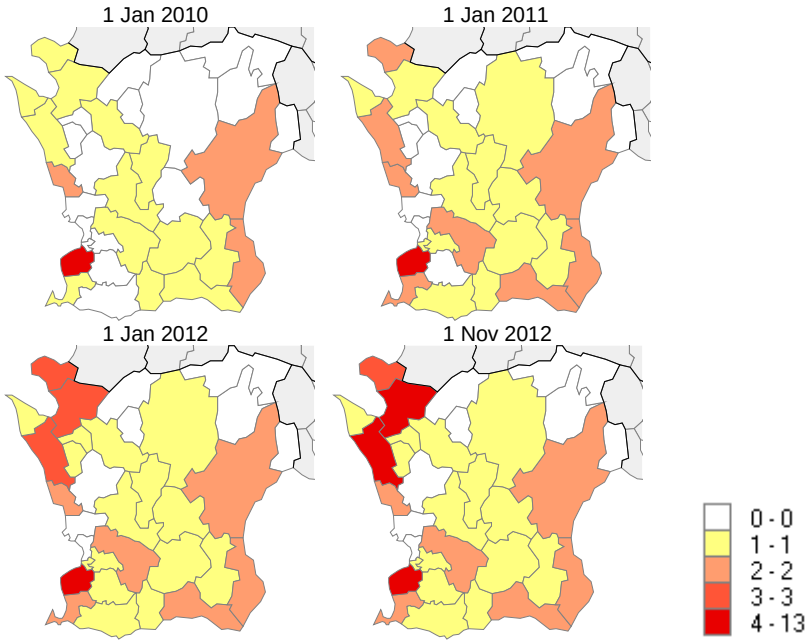


Figure B2. Number of contracted clinics for MDT within the medical rehabilitation guarantee in the Skåne municipalities

Appendix C: Matching models and descriptive statistics of the matched samples

Table C1. Estimation of the propensity to receive CBT, not on sick leave

	Estimate	Standard error	p-value
Intercept	– 2.299	0.071	<.0001
Year 2012	0.324	0.023	<.0001
Male	– 0.186	0.024	<.0001
Married	– 0.114	0.025	<.0001
Age	– 0.011	0.001	<.0001
Foreign born	– 0.471	0.033	<.0001
Earnings	0.000	0.000	<.0001
Education			
High school	0.560	0.042	<.0001
College	0.946	0.043	<.0001
Missing	– 0.824	0.147	<.0001
Unemployed	– 0.116	0.030	0.0001
Labor market status in November last year			
Not employed, with earnings statement	– 0.095	0.032	0.003
Not employed, without earnings statement	– 0.211	0.042	<.0001
Outpatient care visits			
Total, since 2008	0.097	0.013	<.0001
Total, quarter-1	– 0.067	0.004	<.0001
Total, quarter-2	– 0.007	0.004	0.060
Doctor visits, quarter-1	0.446	0.011	<.0001
Doctor visits, quarter-2	0.291	0.012	<.0001
Doctor visits, quarter-3	0.117	0.012	<.0001
Doctor visits, quarter-4	– 0.040	0.014	0.005
Mental illness diagnosis, since 2008	– 0.209	0.007	<.0001
Mental illness diagnosis, quarter-4	– 0.144	0.038	0.0001
Pain-related diagnosis, since 2008	– 0.070	0.010	<.0001
Pain-related diagnosis, quarter-2	0.168	0.028	<.0001
Primary care, since 2008	– 0.095	0.013	<.0001
Specialist care, since 2008	– 0.093	0.013	<.0001
Specialist care, quarter-1	– 0.378	0.018	<.0001
Specialist care, quarter-2	– 0.123	0.017	<.0001
Specialist care, quarter-4	0.065	0.016	<.0001
Drug prescriptions			
Number of prescriptions since 2008	– 0.003	0.000	<.0001
Number of prescriptions, quarter-1	0.015	0.003	<.0001
Value of prescriptions, during last year	0.000	0.000	0.062

Note: In the estimation we also include diagnosis code (10 categories) and calendar month of the health care visit (12 categories).

Table C2. Estimation of the probability of receiving CBT, on sick leave

	Estimate	Standard error	p-value
Intercept	– 3.157	0.146	<.0001
Year 2012	– 0.331	0.044	<.0001
Male	– 0.149	0.051	0.004
Age	– 0.010	0.002	<.0001
Foreign born	– 0.370	0.065	<.0001
Earnings (1,000 SEK)	0.000	0.000	0.000
Education			
High school	0.282	0.080	0.000
College	0.574	0.082	<.0001
Missing	– 0.322	0.528	0.542
Unemployed	– 0.078	0.066	0.244
Outpatient care visits			
Total, quarter-1	– 0.056	0.005	<.0001
Doctor visits, quarter-1	0.290	0.015	<.0001
Doctor visits, quarter-2	0.075	0.017	<.0001
Mental illness diagnosis, since 2008	– 0.203	0.023	<.0001
Mental illness diagnosis, during last year	0.365	0.040	<.0001
Mental illness diagnosis, quarter-2	– 0.480	0.048	<.0001
Mental illness diagnosis, quarter-3	– 0.329	0.059	<.0001
Mental illness diagnosis, quarter-4	– 0.452	0.073	<.0001
Specialist care, quarter-1	– 0.151	0.018	<.0001
Number of drug prescriptions, quarter-1	0.015	0.004	<.0001
Sickness benefit days			
Days, quarter-1	0.025	0.001	<.0001
Days, quarter-2	– 0.004	0.001	0.000
Days during last 3 years	– 0.000	0.000	0.010
Full-time sick leave	– 0.245	0.061	<.0001
Outpatient care visits, mental illness diagnosis, quarter-1* Number of sickness benefit days, quarter-1	– 0.008	0.001	<.0001

Note: In the estimation we also included diagnosis (10 categories).

Table C3. Estimation of the probability of receiving MDT, not on sick leave

	Estimate	Standard error	p-value
Intercept	– 6.281	0.425	<.0001
Year 2010	– 0.369	0.081	<.0001
Year 2012	– 0.198	0.074	0.008
Male	– 0.610	0.061	<.0001
Age	0.138	0.019	<.0001
Age^2	– 0.002	0.000	<.0001
Foreign born	– 0.324	0.067	<.0001
Less than high school education	– 0.127	0.075	0.090
Unemployed	0.218	0.067	0.001
Labor market status in November last year			
Not employed, with earnings statement	0.212	0.081	0.009
Not employed, without earnings statement	0.037	0.086	0.665
Outpatient care visits			
Total, during last year	0.016	0.003	<.0001
Total, quarter-3	– 0.016	0.008	0.036
Doctor visits, quarter-1	0.214	0.022	<.0001
Doctor visits, quarter-2	0.156	0.024	<.0001
Mental illness diagnosis, quarter-1	0.012	0.028	<.0001
Pain-related diagnosis, quarter-1	– 0.171	0.019	<.0001
Specialist care, quarter-1	– 0.202	0.034	<.0001
Specialist care, quarter-2	– 0.104	0.033	0.002
Inpatient care days since 2008	– 0.017	0.005	0.001
Number of drug prescriptions, during last year	0.003	0.002	0.081
Sickness benefit days, during last year	0.003	0.000	<.0001

Note: In the estimation we also include diagnosis (4 categories) and calendar month of the health care visit (12 categories).

Table C4. Estimation of the probability of receiving MDT, on sick leave

	Estimate	Standard error	p-value
Intercept	– 5.216	0.678	<.0001
Year 2010	– 0.166	0.081	0.041
Male	– 0.378	0.084	<.0001
Age	0.081	0.030	0.007
Age^2	– 0.001	0.000	0.002
Less than high school education	– 0.222	0.100	0.027
Outpatient care visits			
Doctor visits, quarter-1	0.055	0.019	0.004
Mental illness diagnosis, quarter-1	0.038	0.026	0.143
Pain-related diagnosis, since 2008	– 0.020	0.007	0.003
Pain-related diagnosis, quarter-1	– 0.210	0.021	<.0001
Inpatient care days since 2008	– 0.012	0.004	0.001
Full-time sick leave	– 0.336	0.092	0.000
Sickness benefit days			
Days, quarter-1	0.021	0.001	<.0001
Days, quarter-4	– 0.002	0.001	0.073
Days during last 10 years	0.000	0.000	0.003

Note: In the estimation we also include diagnosis (4 categories) and calendar month of the health care visit (12 categories).

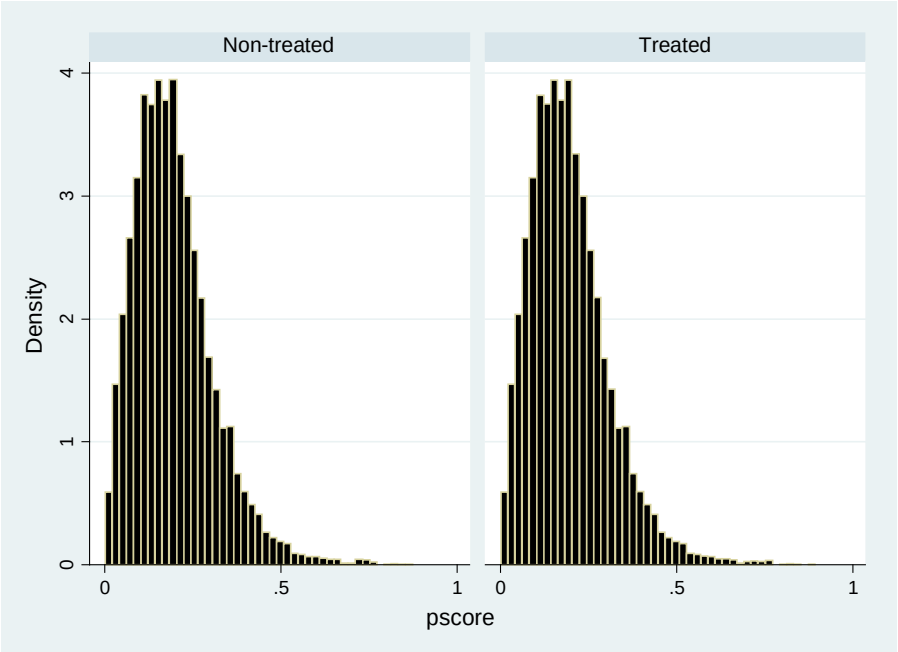


Figure C1. Distribution of estimated propensity scores for the treated and non-treated for the CBT sample, not on sick leave

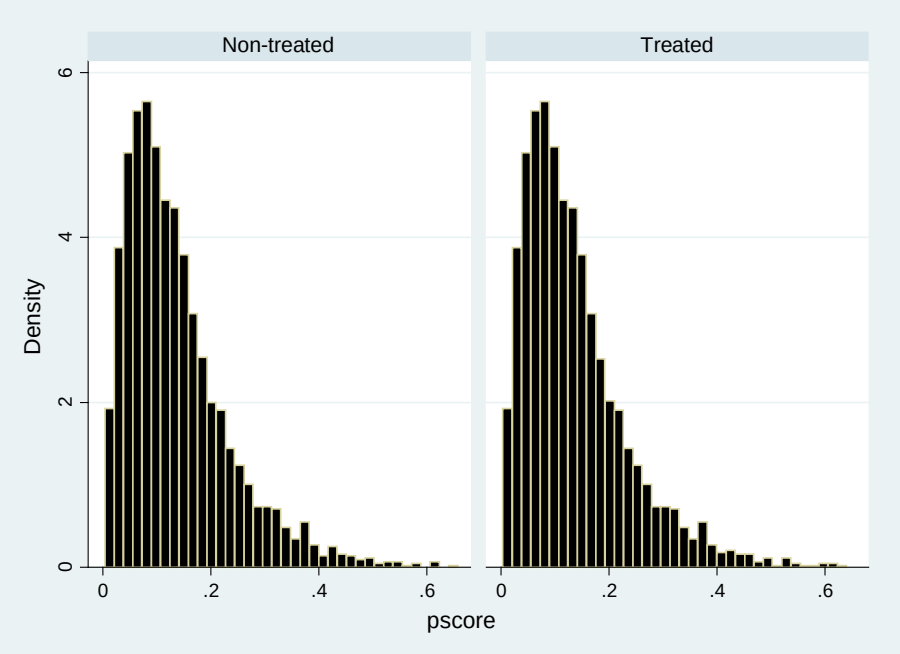


Figure C2. Distribution of estimated propensity scores for the treated and non-treated for the CBT sample, on sick leave

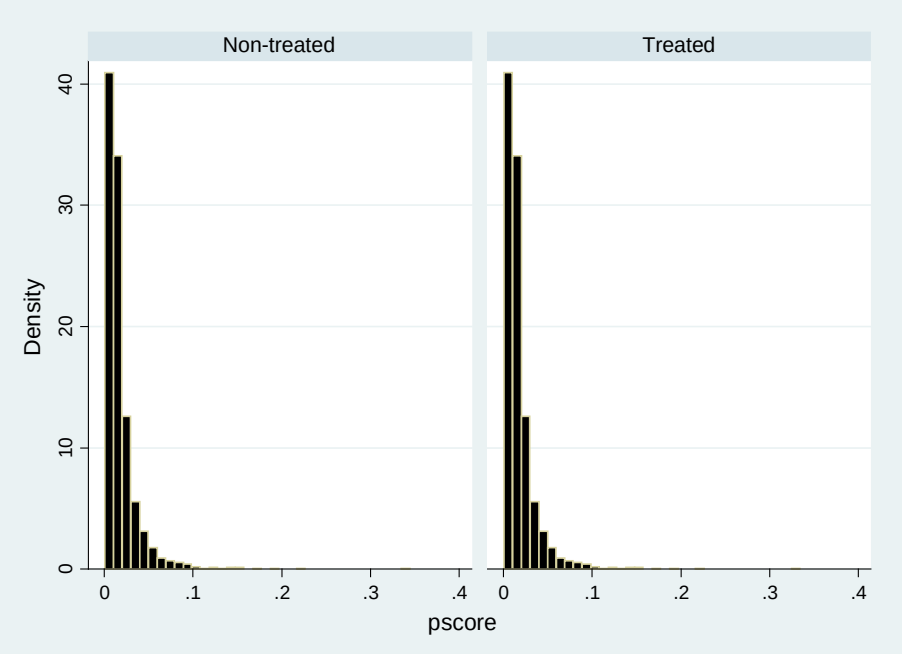


Figure C3. Distribution of estimated propensity scores for the treated and non-treated for the MDT sample, not on sick leave

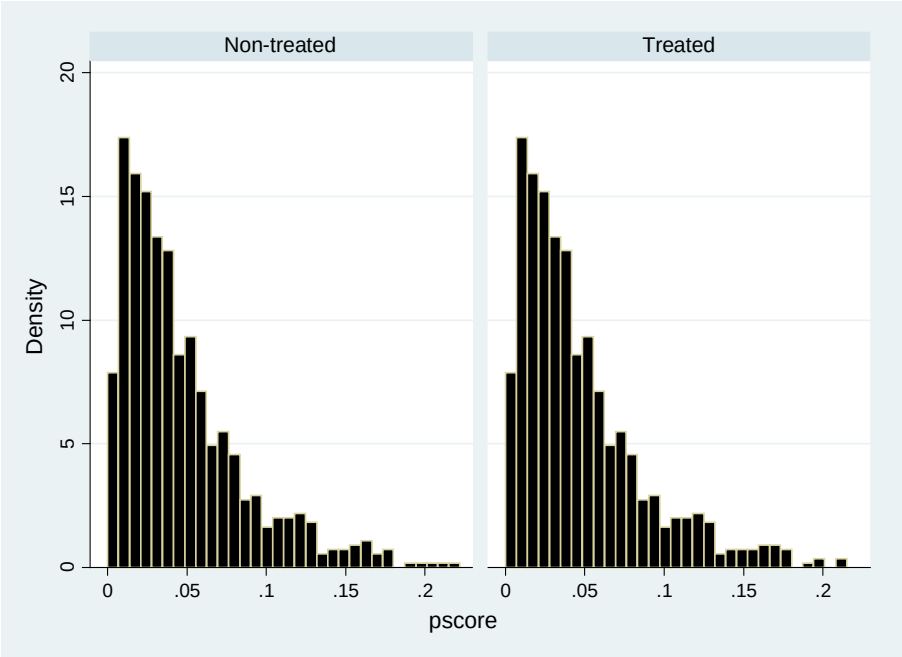


Figure C4. Distribution of estimated propensity scores the treated and non-treated for the MDT sample, on sick leave

Appendix D: Result validation

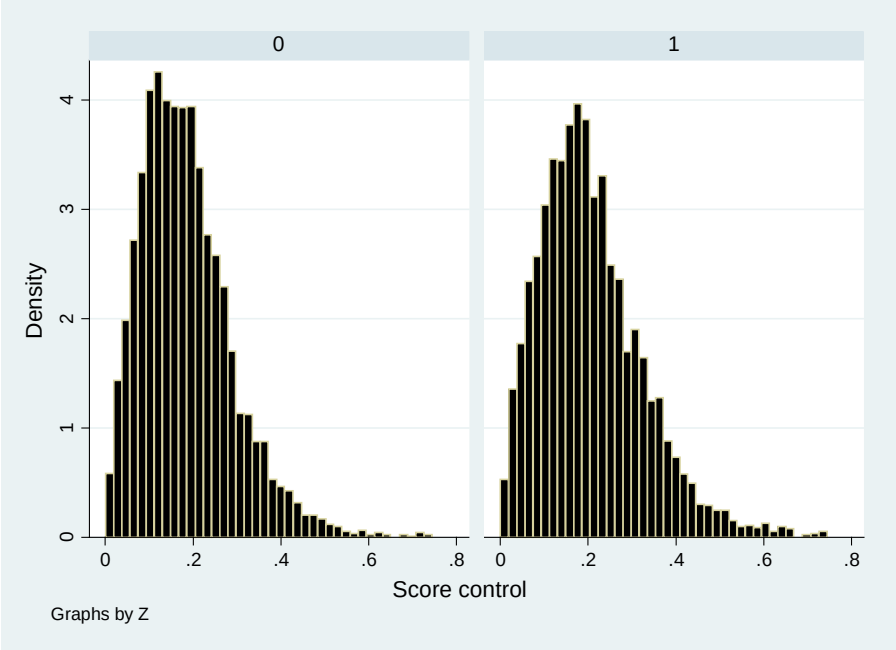


Figure D1. Distribution of the propensity to live in an area with the number of contracted clinics in the surrounding area above the median number (Z=1) for those on CBT (1) and not on CBT (0) for sample, not on sick leave

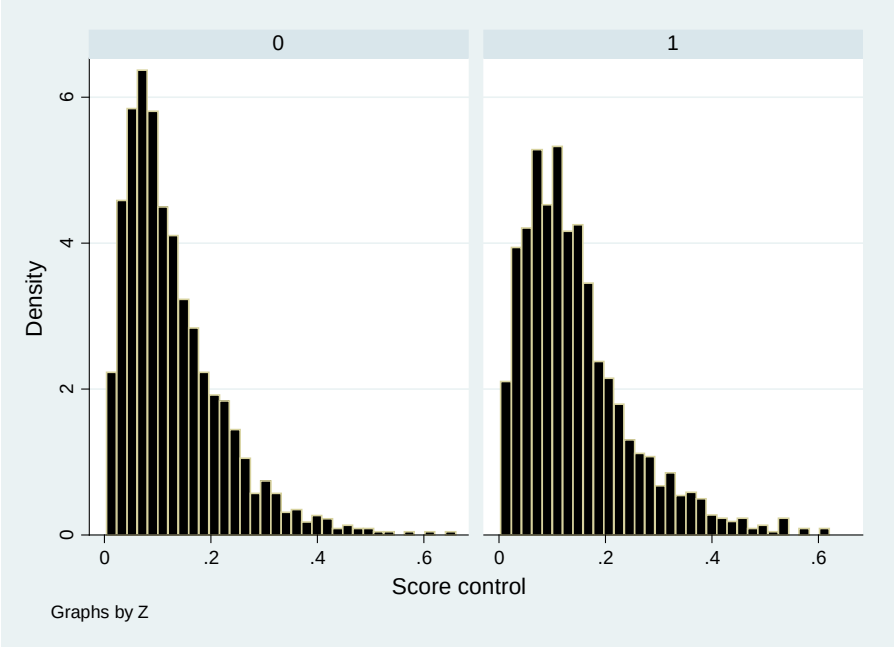
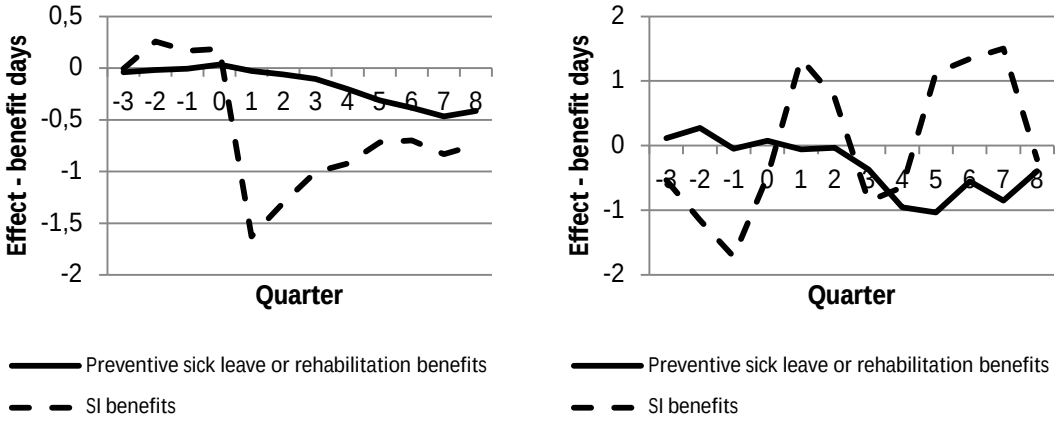


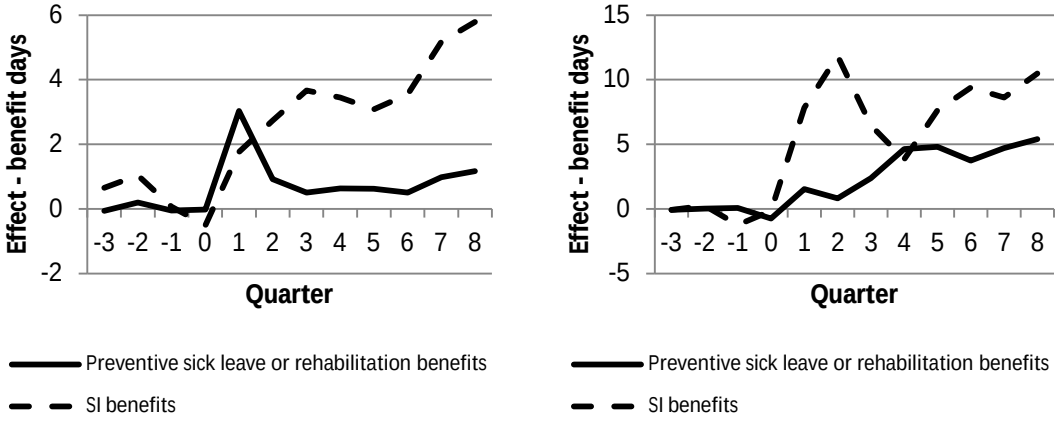
Figure D2. Distribution of the propensity to live in an area with the number of contracted clinics in the surrounding area above the median number (Z=1) for those on CBT (1) and not on CBT (0) for CBT sample, on sick leave

Appendix E: Results by sickness benefits types



(a) CBT, not on sick leave

(b) CBT, on sick leave



(c) MDT, not on sick leave

(d) MDT, on sick leave

Figure E1. Effects of CBT and MDT on different types of sick-leave benefits, by sick leave status at the beginning of treatment

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