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Research paper

# The gendered effect of rehabilitative psychotherapy use on income: Quasi-experimental evidence from a Finnish population with work disability due to common mental disorders

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ABSTRACT

*Background:* With tightening healthcare budgets, assessing the economic impact of mental health treatments is crucial for informing policy measures. Sociodemographic factors, such as gender, are associated with these outcomes. We studied the gender-specific impact of long-term rehabilitative psychotherapy on the income of working-age individuals who had experienced sick leave due to common mental disorders (CMD).

*Methods:* We analyzed register data from 2010 to 2019, covering a 33 % random sample of the Finnish working-age population (aged 18–55 in 2010). The sample included 32,558 individuals with their first compensated sickness absence for CMD during 2011–2015. Of these, 4592 (76.1 % women) began psychotherapy, the rest formed the control group. We used difference-in-differences regression with inverse probability weighting to estimate the average treatment effects on the treated (ATT) for women and men relative to the timing of treatment.

*Results:* The average effect was negligible for women (ATT: 0.01, 95 % Confidence Interval: −0.03 – 0.06), while men experienced a substantial 27 % increase in income (ATT: 0.27, 95 % CI: 0.13–0.42). Event-study estimates indicated that the effect on men's income was immediate and long-lasting.

Limitations: Analysis of our findings is restricted to observed register-based covariates including work disability and employment status, and individual- and time-fixed effects.

*Conclusions:* Among those who had received compensated sick leave due to CMD, men experienced an immediate and long-lasting increase in income after undergoing psychotherapy, while no such effect was observed for women. Further research is needed to explore factors such as selection for treatment, occupational segregation, and treatment engagement among recipients.

## 1. Introduction

Globally, the prevalence of depressive disorders has been estimated to be 4.4 %, anxiety disorders have been estimated to affect 3.6 % of the population, and the burden of common mental disorders (CMD) is estimated to increase (WHO, 2017). Moreover, an annual number of 12 billion working days are lost due to CMD (WHO and ILO, 2022). The related costs of CMD are likely to increase, with productivity costs being a significant component. Examining and economically assessing the labor market effects of CMD treatments is crucial for understanding the broader economic implications of these conditions and informing policy decision.

Psychotherapies are among evidence-based treatments for CMD: Meta-analyses have demonstrated the positive effects of psychotherapy in treating CMD (Munder et al., 2019; Driessen et al., 2015; Carl et al., 2020), including reductions in sickness absence related to CMD (Finnes et al., 2019; Nigatu et al., 2016), and favorable employment-related outcomes (Minjoo et al., 2014). Evidence from meta-analyses is partially based on a limited number of small-scale studies with selected patient groups, resulting in diminished statistical power and limited

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generalizability. Additionally, the reliability of the findings depends heavily on the quality of these underlying studies. Short follow-up periods may hinder a thorough examination of relevant labor market effects, which may require longer to manifest.

Recent research utilizing register data has made substantial progress in overcoming the challenges associated with small-scale studies, short follow-up periods, in investigating the effects of treatments for CMD. As a result, this line of research has offered evidence of population-level labor market effects and factors associated with these effects (Kausto et al., 2022; Leppänen et al., 2022; Peutere et al., 2022; Leppänen et al., 2023; Selinheimo et al., 2023a; Selinheimo et al., 2023b). However, it is important to note that these advancements are currently limited to studies using extensive Finnish register data.

Research using comprehensive Finnish register data has shown that psychotherapy is associated with reduced work disability (Kausto et al., 2022; Peutere et al., 2022), increased employment rates, and higher annual income (Peutere et al., 2022). Despite these favorable labor market effects, it is important to acknowledge the disparities in the use of psychotherapy. Studies from Germany (Epping et al., 2017), Canada and Australia (Bartram and Stewart, 2019), and UK (Jokela et al., 2013) have identified various socioeconomic characteristics associated with the use of psychotherapy. Recent research in Finland supports these findings (Leppänen et al., 2022; Leppänen et al., 2023; Selinheimo et al., 2023a). In the Finnish context, sociodemographic and socioeconomic factors have also been associated with the outcomes of psychotherapy and its related effects (Selinheimo et al., 2023b). Notably, older age, female gender, and lower occupational status were associated with poorer work disability outcomes even after receiving psychotherapy (Selinheimo et al., 2023b). These findings suggest that both the use of psychotherapy and its impact on income may vary across different groups.

Given that in Finland, rehabilitative psychotherapy aimed at the working-age population focuses on improving and maintaining work ability to facilitate economic participation, it is reasonable to assume that it may impact earnings and their long-term growth of individuals who have previously experienced work disability. The existing evidence from Finland suggests a positive effect of psychotherapy on income (Peutere et al., 2022). However, evidence from socioeconomic factors playing a role in the Finnish psychotherapy use (Leppänen et al., 2022; Leppänen et al., 2023; Selinheimo et al., 2023a; Selinheimo et al., 2023b) suggests that the effect of psychotherapy on income may vary between different groups, such as women and men. We used a quasi-experimental design to examine whether the effect of the rehabilitative psychotherapy on income differs between women and men, focusing on individuals who had already experienced episodes of sickness absence due to CMD. We analyzed national register data using two different research designs, considering the effects relative to the timing of the psychotherapy use.

## 2. Methods

### 2.1. Study context, the psychotherapy compensation policy in Finland

In 2011, Finland implemented a policy to ensure funding for the reimbursement of rehabilitative psychotherapy to all eligible individuals. This marked a shift from the previous budget-dependent funding approach, which had restricted access to psychotherapy despite the demand. Rehabilitative psychotherapy requires eligible individuals to cover a portion of the costs. To qualify, applicants must be between 16 and 67 years old and at risk of work or study disability due to a mental disorder. Additionally, individuals seeking compensated rehabilitative psychotherapy must have received three months of appropriate first-line treatments (primarily psychopharmacological drugs, short-term counselling, or internet-delivered therapy). If these initial treatments prove ineffective and the risk of disability to work or study remains, individuals need a referral from a psychiatrist to access rehabilitative psychotherapy.

Partially state-compensated rehabilitative psychotherapy aims to enhance individuals' capacity to work or study, facilitating their economic participation and promoting the ability to sustain, pursue, or resume employment or education (Kela, 2024). The Social Insurance Institution of Finland (SII) provides compensation for rehabilitative psychotherapy for 1–3 years, one year at a time. The maximum number of sessions over three years is 200, with yearly limit of 80 sessions. There is no minimum required number of sessions. Rehabilitative psychotherapy can be provided in various forms, including individual, group, family or couple's psychotherapy, and art therapy. In 2021, the most common approaches used in Finland with a proportion of over 95 % of all psychotherapies initiated include cognitive, cognitive behavioral, cognitive analytic, psychodynamic or psychoanalytic, integrative, or solution-focused psychotherapy, with solution focused therapy representing the most common approach used (Selinheimo et al., 2024).

### 2.2. Data

We used a 33 % random sample cohort of the working-age population of Finland from the Rise of Mental Vulnerability Dataset (see e.g., Kausto et al., 2022; Olakivi et al., 2023; Selinheimo et al., 2023a; Selinheimo et al., 2023b). The cohort was based on the census year 2013, and we followed it using register data from 2010 to 2019. The cohort population ($N$ = 868,057) was between the ages of 18 and 55 years in 2010, remaining within working age until 2019.

We matched the data from the SII and Statistics Finland using the personal identification number assigned to all Finnish citizens. The SII register data included information on all compensated rehabilitative psychotherapy episodes and all compensated sickness absence days lasting >9 days (shorter episodes are not available from the registers) between 2004 and 2019. The data from Statistics Finland included the total taxable gross income, unemployment months, and background characteristics such as age, gender, education, employment status, and area of residence. Data were available for the period from 2010 to 2019.

The study group comprised a balanced panel of all individuals in the 33 % random sample of working-age population who had their first compensated sickness absence due to common mental disorders (ICD10: F32-F33 or F40-F43) between 2011 and 2015. We used balanced panel data, removing individuals without data for any year between 2010 and 2019 from the analysis. Specifically, 1889 individuals were dropped out from the follow-up due to missing data for one or more year(s), as they either died, immigrated, or emigrated during this period. Of these, a total of 860 individuals died (807 in the control group and 53 in the treatment group), 431 immigrated (330 in the control group and 101 in the treatment group), and 598 emigrated (478 in the control group and 120 in the treatment group) during the follow-up. Consequently, our analysis utilized a balanced panel of 32,558 individuals followed between 2010 and 2019.

There was a total number of 5042 individuals who began rehabilitative psychotherapy within our study sample (see Appendix 1 and Appendix Table 1 for more information). They comprised the treatment group in this study. The remaining 27,516 individuals formed the control group.

### 2.3. Outcome

The primary outcome variable was the logarithm of annual taxable income, measured in euros. The income data were collected from 2010 to 2019 and analyzed based on the time relative to when psychotherapy treatment was used. We present the average outcomes for the five years preceding the start of psychotherapy treatment and the five years following its initiation. To ensure data security, the income for the highest income decile was top coded at the value of the yearly median income for that decile. Moreover, zero income was replaced with a value of 0.01 to allow for logarithmic transformation.

Applying a logarithm to the income resulted in a more normal distribution, which in turn facilitated the estimation process using weighted least squares regression. It enabled us to approximate the percentage change in income.

### 2.4. Treatment variable

The treatment variable was defined as the year of the first SII-compensated psychotherapy session. Individuals in the study began using psychotherapy between 2011 and 2019.

We considered the use of rehabilitative psychotherapy as a staggered treatment, meaning that once individuals received treatment, we assumed they remained exposed to its effects thereafter. Consequently, we assumed that rehabilitative psychotherapy had a lasting effect on both the individual and their income. It is worth noting that individuals used rehabilitative psychotherapy for varying durations, with nearly 90 % receiving treatment for at least two years (see Appendix 1).

### 2.5. Covariates

The covariates used in our regression model included age, educational attainment (categorized into three levels, which were low, secondary, and higher), employment status (four levels which were employed, unemployed, student, outside of the workforce for other reasons), the first year with sickness absence due to F32–33 or F40–43 -diagnoses (ranging from 2011 to 2015), and an annual dummy variable for F32-F33 diagnoses related sickness absence (two levels: 0 if no sickness absence due to F32-F33 or 1 if there was sickness absence due to F32-F33 given year). Regarding geographical area of residence, we classified it according to the collaborative areas for healthcare around five university hospital areas in Finland: southern (Helsinki University Hospital), central (Tampere University Hospital), western (Turku University Hospital), eastern (Kuopio University Hospital), and northern (Oulu University Hospital). We also used a measure of unemployment months and a measure of months in disability both due to sick leave and disability pension and due to any diagnoses as additional covariates.

These covariates were included in both inverse probability weighting and the regression analysis described in more detail in Appendix 2 and below. The absence of multicollinearity among the covariates was evaluated by calculating the Variance Inflation Factor for each covariate.

The information for the first year with sickness absence due to F32–33 or F40–43 -diagnoses, the annual prevalence of F32-F33 or F40-F43 diagnoses, and the changes in employment status and the annual number of disability months for both the treatment and control groups, stratified by gender, are outlined in Appendix 3.

### 2.6. Statistical analyses

To estimate the average treatment effect of psychotherapy on the treated (ATT) regarding the logarithm of income, we employed a doubly robust difference-in-differences estimator (Callaway, and Sant'Anna, P. H. C., 2021; Sant'Anna, P. H. C., and Zhao, J., 2020). A doubly robust difference-in-differences method uses a quasi-experimental design to evaluate the impact of an intervention or treatment by combining the strengths of both inverse probability weighting and difference-in-differences analysis, making it more robust to potential biases in observational data.

The standard difference-in-differences design compares the treatment and control groups before and after the treatment. In this study, we extended this design to cover multiple timing groups, which consisted of individuals who began the use of psychotherapy in different years, over multiple time periods. For each possible 2 × 2 comparison of the treatment and control groups before and after the treatment, we calculated the ATT relative to the timing of the treatment. The difference-in-differences method incorporated both individual and time-fixed effects, accounting for potential time-invariant differences between individuals and time-specific shocks that may affect the outcome variable.

We conducted comparisons between individuals who began psychotherapy in a specific year and a control group consisting of two parts: 1) individuals who did not use psychotherapy at all, and 2) individuals who had not yet started psychotherapy. For instance, individuals who started psychotherapy in 2011 were compared to the control group comprising individuals who never used psychotherapy, as well as those who had not yet started by 2011. This comparison was repeated for all starting groups relative to the timing of treatment in an event-study framework. This approach provides a more comprehensive understanding of how the treatment's impact unfolds over time and enabled to address concerns about potential differences in income trends between psychotherapy users and the control group before the start of psychotherapy use and to estimate the dynamic short- and medium-term effects after the start of the psychotherapy use. The event-study regression equation used for estimation is described in Appendix 2.

The doubly robust difference-in-differences estimator produces a causally interpretable average treatment effect on the treated without random assignment of treatment under the assumption of parallel trends in pre-treatment outcomes. According to the parallel trends assumption in the absence of treatment, treated individuals' outcome would have followed the outcome trend of the control group. Another important assumption needed is that the ATT is homogenous across different individuals and over time. This assumption was relaxed by conducting a stratified analysis based on gender, allowing the treatment effect to vary between men and women rather than assuming it was uniform across all individuals.

As a sensitivity analysis, we included only individuals who used psychotherapy between 2011 and 2019 in the study sample. In this analysis, the control group consisted of those individuals who had not yet received psychotherapy treatment. In the last follow-up year, all belonged to the treatment group. This sensitivity analysis was conducted to detect whether the results remained intact after using a control group with no potential selection bias.

We used Stata 17 and package "csdid" (Callaway, and Sant'Anna, P. H. C., 2021; Sant'Anna, P. H. C., and Zhao, J., 2020) for all analyses.

## 3. Results

### 3.1. Descriptive statistics in the baseline year 2010 for women and men

Table 1 presents the descriptive statistics for the treatment and control groups during the baseline year of 2010, for women and men, separately.

Among those who had their first compensated sickness absence due to CMD between 2010 and 2015, 16.1 % of women received psychotherapy, compared to 10.1 % of men. The women in the treatment group were on average five years younger than those in the control group, whereas men in the treatment group were approximately four years younger than men in the control group.

The treatment group, for both women and men, showed a lower proportion of individuals with lower education compared to the control group. Additionally, in comparison to the control groups, the treatment groups had a slightly lower proportion of employed individuals and a higher proportion of students.

For both genders, the treatment group demonstrated a lower average number of sickness absence days attributed to musculoskeletal disorders (ICD10: M) or other reasons (excluding ICD10: F32-F33, F40-F43, or M) compared to the control group. Moreover, the treatment groups exhibited fewer months of unemployment in comparison to the control groups, with a larger difference observed for men in comparison to women.

Income, disability months, and employment status progression for women and men diagnosed with CMD in 2010–2015.

Fig. 1 shows the income trajectories for the treatment and control

**Table 1**
Descriptive Statistics of Participants in the Treatment and Control Groups at the Baseline Year 2010.

| | | WOMEN ($N$ = 21,643) | | | MEN ($N$ = 10,915) | | |
|---|---|---|---|---|---|---|---|
| | | Psychotherapy use ($N$ = 3495) | Control ($N$ = 17,698) | $P$-value for difference | Psychotherapy use ($N$ = 1097) | Control ($N$ = 9818) | $P$-value for difference |
| Age, Mean (SD) | | 32.6 (10.1) | 37.4 (10.8) | <0.001 | 32.2 (9.8) | 36.3 (10.7) | <0.001 |
| Education, % | | | | <0.001 | | | <0.001 |
| | Lower | 52.2 | 63.9 | | 63.2 | 77.2 | |
| | Intermediate | 30.7 | 27.7 | | 21.0 | 16.6 | |
| | High | 17.1 | 8.4 | | 15.9 | 6.3 | |
| Employment status, % | | | | <0.001 | | | <0.001 |
| | Employed | 74.3 | 79.3 | | 72.7 | 74.4 | |
| | Unemployed | 5.7 | 7.8 | | 6.6 | 12.3 | |
| | Student | 15.5 | 7.9 | | 16.9 | 7.9 | |
| | Outside workforce for different reasons | 4.5 | 5.0 | | 3.8 | 5.3 | |
| University hospital district, % | | | | <0.001 | | | <0.001 |
| | Southern | 40.0 | 37.7 | | 37.0 | 36.9 | |
| | Eastern | 15.9 | 14.4 | | 15.7 | 13.8 | |
| | Central | 16.7 | 16.9 | | 16.3 | 19.1 | |
| | Western | 14.2 | 15.9 | | 16.5 | 14.0 | |
| | Northern | 13.2 | 15.1 | | 14.5 | 16.3 | |
| Sickness absence days, Mean (SD) | | | | | | | |
| | Due to F32–33- or F40–43-diagnoses | 0 (0) | 0 (0) | | 0 (0) | 0 (0) | |
| | Due to M-diagnoses | 1.9 (13.8) | 3.3 (19.3) | <0.001 | 1.4 (12.9) | 3.0 (19.8) | <0.01 |
| | Due to other diagnoses | 3.6 (18.5) | 4.2 (19.7) | 0.099 | 2.5 (17.0) | 4.3 (22.3) | <0.01 |
| Unemployment months, Mean (SD) | | 0.7 (2.0) | 0.9 (2.5) | <0.001 | 0.8 (2.4) | 1.5 (3.1) | <0.001 |
| Income in euros, Mean (SD) | | 22,221 (15463) | 23,831 (13692) | <0.001 | 26,804 (19146) | 27,195 (17411) | 0.485 |

Note i. The differences between the treatment and control groups were examined using a t-test (for the difference in Age, Sickness absence days, Unemployment months, and Income) and Pearson Chi-Squared test (for the difference in Education, Employment status, and University hospital district). SD = Standard Deviation.

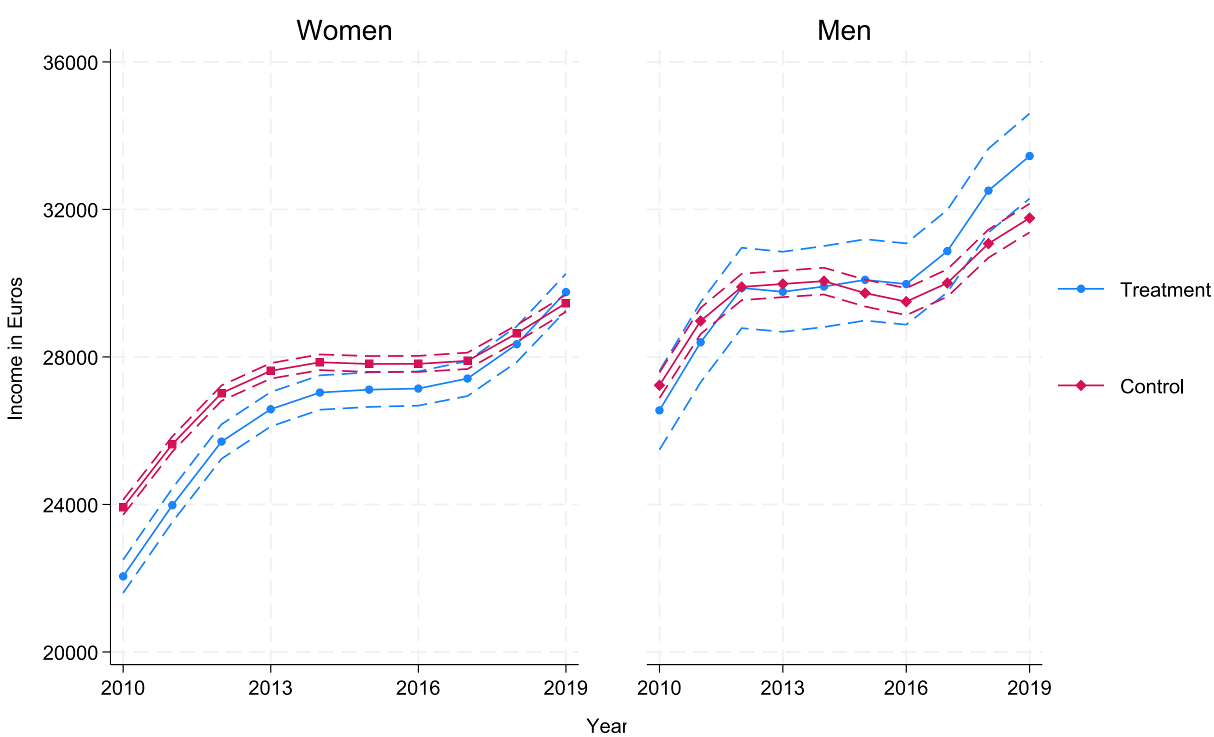


**Fig. 1.** Annual Income in Euros with 95 % Confidence Intervals for Treatment and Control Groups for Women and Men. Sample sizes for women: Treatment group $N$ = 3495, Control group $N$ = 17,698; for men: Treatment group $N$ = 1097, Control group $N$ = 9818.

groups separately for women and men. Appendix 3 provides additional details regarding the total number of disability months and employment status of the treatment and control groups for the follow-up years.

As shown in Table 1, in 2010, women in the treatment group had lower income in comparison to women in the control group. Similarly, men in the treatment group had lower income in comparison to men in the control group. From 2010 to 2019, there was an average increase of approximately 7000 to 8000 euros in the income of women both in the treatment and control groups. However, the increase was slightly larger for those in the treatment group. Similarly, the income for men saw an average increase of approximately 5000 to 7000 euros, with the treatment group showing a greater increase.

The income for women remained lower compared to men during the 2010s. In the baseline year 2010, both women and men in the treatment groups had on average lower income in comparison to the control groups. This income disparity was statistically significant for women. The income for men in the treatment group surpassed that of the control group in 2015. For the women, the treatment group demonstrated higher income in comparison to the control group only in the last year of the follow-up.

Appendix 3, Appendix Table 3 shows differences in employment status between women in the treatment and control groups. The employment gap between the groups narrowed from 5 to 2 percentage points by 2019. The level of unemployment for the treatment group varied (5.5 % to 11.7 %) yet remained smaller in comparison to the control group (7.3 % to 13.3 %). The treatment group had a higher proportion of students with a gap of 4 % to 8 % compared to the control group. Both groups had a similar share of individuals outside the workforce.

Appendix Table 4 presents the average annual disability months. Women in the treatment group had, on average, more disability months throughout the follow-up period compared to the control group. The average for the treatment group ranged between 0.2 and 2.0, while that of the control group ranged between 0.2 and 1.3.

In the first three years of the follow-up, men in the treatment group had slightly lower employment rates than the control group (Appendix 3, Appendix Table 3). However, from 2013 onwards, the treatment group showed higher employment rates despite decreases in both groups. Throughout the follow-up, the treatment group had more students and fewer unemployed individuals. The proportion of individuals outside the workforce was also smaller in the treatment group. Both groups saw an increase in individuals outside the workforce, rising from 4 % to 16 % in the treatment group and from 5 % to 19 % in the control group.

Men in the treatment group had more disability months throughout the follow-up period compared to the control group (Appendix Table 4). The average for the treatment group ranged between 0.1 and 2.3, while that of the control group ranged between 0.2 and 1.7.

### 3.2. The effect of psychotherapy on income for women and men

Table 2 and Fig. 2 depict the estimated treatment effect of psychotherapy use on the logarithm of income relative to the timing of the first use of psychotherapy, for both women and men.

For women, the estimated average pre-treatment effect was a statistically significant 0.03 (95 % CI: 0.00–0.05), indicating a positive impact. However, the estimated annual pre-treatment effects for women were close to zero, suggesting minimal differences between the groups before treatment. The estimates were statistically significant for the third (0.05, 95 % CI: 0.00–0.11) and first (0.05, 95 % CI: 0.01–0.05) year before treatment.

The estimated average pre-treatment effect for men was 0.02 (95 % CI: −0.03 − 0.07). The estimated annual effects were between −0.10 (during the first year before the treatment, 95 % CI: −0.22 − 0.03) and 0.20 (during the fifth year before the treatment, 95 % CI: 0.03–0.37). Notably, the estimate for the fifth year before psychotherapy use shows potentially coincidental deviation from the parallel trends assumption (0.20, 95 % CI: 0.03–0.37).

The estimated post-treatment effects relative to the timing of the treatment for men were consistently positive during the post-treatment years. The estimated annual effects ranged from 0.28 (95 % CI: 0.17–0.40) in the first post-treatment year to 0.32 (95 % CI: 0.10–0.53) in the fifth post-treatment year.

### 3.3. The sensitivity analysis using only those who initiated psychotherapy

Appendix 4, Appendix Table 7, and Appendix Fig. 1 present the regression results based on a study sample consisting of individuals who started using psychotherapy between 2011 and 2019. In this study design, the annual control group comprises individuals who had not yet begun using psychotherapy but did so eventually during the follow-up period.

The estimated effects for both women and men were aligned with the main analysis. We found support for the parallel trends assumption. The

**Table 2**
The Estimated Dynamic Pre- and Post-Treatment Effects of Psychotherapy Use on the Logarithm of Income for Both Women and Men, Along with 95 % Confidence Intervals.

| WOMEN | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Before the use of psychotherapy | | | | | After the use of psychotherapy | | | | |
| Average effect: **0.03 (0.00–0.05)** | | | | | Average effect: 0.01 (−0.03–0.06) | | | | |
| Year T-5 | Year T-4 | Year T-3 | Year T-2 | Year T-1 | Year T 0 | Year T + 1 | Year Y + 2 | Year T + 3 | Year T + 4 |
| 0.02 (−0.06–0.10) | 0.03 (−0.03–0.10) | **0.05 (0.00–0.11)** | 0.00 (−0.06–0.05) | **0.05 (0.01–0.05)** | 0.02 (−0.01–0.06) | 0.03 (−0.02–0.07) | 0.02 (−0.03–0.07) | 0.00 (−0.06–0.07) | 0.02 (−0.06–0.09) |

| MEN | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Before the use of psychotherapy | | | | | After the use of psychotherapy | | | | |
| Average effect: 0.02 (−0.03–0.07) | | | | | Average effect: **0.27 (0.13–0.42)** | | | | |
| Year T-5 | Year T-4 | Year T-3 | Year T-2 | Year T-1 | Year T 0 | Year T + 1 | Year Y + 2 | Year T + 3 | Year T + 4 |
| **0.20 (0.03–0.37)** | −0.03 (−0.19–0.10) | −0.07 (−0.21–0.07) | 0.09 (−0.06–0.23) | −0.10 (−0.22–0.03) | **0.28 (0.17–0.40)** | **0.26 (0.12–0.40)** | **0.30 (0.12–0.47)** | **0.31 (0.13–0.50)** | **0.32 (0.10–0.53)** |

Note ii. The analysis is based on difference-in-differences regression using event-study design and includes separate analysis for women (N = 3945 in the treatment group, and N = 17,698 in the control group) and men (N = 1097 in the treatment group, and N = in the control group). Year T 0 depicts the first year of psychotherapy use. The cells display the estimated dynamic effect along with the corresponding 95 % Confidence Interval in parentheses. The logarithms of income reflect the percentage difference in income between the treatment and control groups. A value of −0.03 indicates a negative 3 % difference in the income between the two groups. Statistically significant effects have been bolded. The annual numbers of individuals in the treatment and control group are described in more detail in Appendix *1*. The estimation is described in more detail in Appendix *2*.

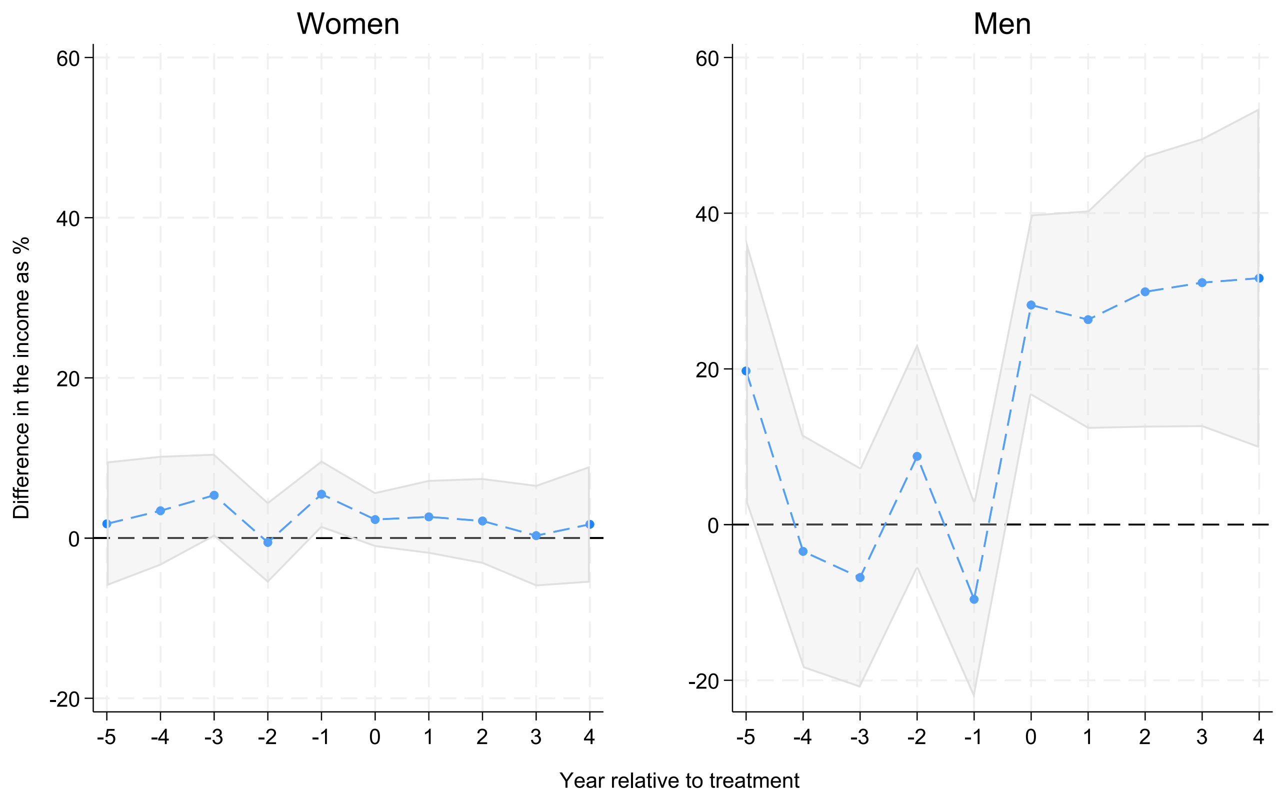


**Fig. 2.** The Estimated Dynamic Pre- and Post-Treatment Effect of Psychotherapy Use on Income for Both Women and Men. The Y-axis represents the Percentual Difference in Income Between the Treatment and Control Groups, while the X-axis Indicates the Year Relative to the First Psychotherapy Use. The Blue Line Depicts the Estimated Effect, and the Grey Area Represents the 95 % Confidence Interval for the Estimate. Additional details on the annual numbers of individuals in the treatment and control group can be found in Appendix 1, while further information on the estimation process is provided in Appendix 2. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

estimated post-treatment effects for women were larger in magnitude compared to estimates from the main analysis. In more detail, the estimated effects were slightly more negative, while for men the coefficients shared a similar pattern to the main analysis. However, for men most of the post-treatment effects were non-significant, indicating a lack of statistical power to detect significant differences.

## 4. Discussion

In this national population-based register study using a quasi-experimental approach, we found that rehabilitative psychotherapy increased post-treatment income for men but not for women. Specifically, the impact on women's income was either declining or, at best, insignificant, whereas for men, it showed an increase of nearly 30 %.

In our analysis using both regression analysis and inverse probability weighting, the annual difference-in-differences in income between the treatment and control groups for women remained relatively stable and economically negligible five years before and after starting psychotherapy. In contrast, for men, the increase in income for the treatment group relative to the control group became apparent immediately after starting psychotherapy, with the income disparity persisting for five years. To further validate our findings, we conducted a sensitivity analysis using a study group consisting solely of individuals who eventually began psychotherapy. By comparing the income trajectories of psychotherapy users with those of psychotherapy users who had not yet started psychotherapy, we obtained results that closely aligned with our main analysis. This congruence between the two analyses further reinforces the evidence supporting the positive effects of psychotherapy on income for men and strengthens the credibility of our conclusions.

There is a discrepancy in the results between our findings and those of Peutere et al. (2022), who reported a 2100-euro annual income advantage for psychotherapy users, three-fourths of whom were women. Our study also contributes to the work disability findings of Kausto et al. (2022), who reported psychotherapy associated with reduced work disability but did not observe gender differences in outcomes. Differences in findings can be attributed to several factors, including study design, methods used, and the specific population under investigation. Firstly, our study focused on individuals with their first sickness absence due to CMD between 2011 and 2015, whereas Peutere et al. (2022) included all psychotherapy users from 2011 to 2012 compared to non-users from 2009 to 2010, considering a natural experiment based on a change in the funding approach. By examining individuals with sickness absence related to CMD, we investigated the psychotherapy effects within a more homogenous group, likely with more severe conditions. Secondly, we captured the dynamic effects over time, unlike Peutere et al. (2022), who compared the outcomes five years from the psychotherapy onset. Thirdly, we used both inverse probability weighting and regression analysis, unlike the previous studies that relied on a natural experiment with propensity score matching (Peutere et al., 2022) or interrupted time series analysis without a control group (Kausto et al., 2022). While Kausto et al. (2022) found no gender-related differences in work disability outcomes, our study indicates notable differences in income evolution between women and men among those who experienced work disability due to CMD. This suggests that income in this specific group is influenced by multiple factors beyond work disability alone.

The divergence in post-treatment income progression between women and men is not due to work disability or whether the diagnoses are depression or anxiety related. We found that for the treatment group, regardless of gender, the total number of disability months due to any diagnosis was higher, and there were more students and fewer those outside the workforce for various reasons. Sick leaves due to depression were more prevalent in the treatment group for both women and men throughout the follow-up, while anxiety-related absences were more common in the control group during the initial years of the follow-up. The disparity in employment rates between women in the treatment and control groups was more pronounced, with women in the treatment group showing more employment. The employment rates for men in the treatment and control groups were relatively similar, with men in the treatment group increasing employment relative to men in the control group through follow-up. Despite controlling for work disability months (including both sick leave and disability pension), unemployment months, depression-related sick leave indicators, and employment status in the regression analysis for the total follow-up, as well as in inverse probability weighting for the pre-treatment period, the income disparity persists. This pattern remains true even after focusing exclusively on psychotherapy users in the sensitivity analysis. These findings indicate potential differences in how men and women who have experienced sickness absence due to CMD using psychotherapy cope in the labor market.

In addition to the factors we studied and controlled for, other potential contributors to our findings exist. One such factor is the decision to seek help and use psychotherapy. Specifically, research suggests that men are less likely to seek help for depression (Magaard et al., 2017; Seidler et al., 2016). Additionally, gender differences exist in the expression of emotions and the ability to communicate them (Weisberg et al., 2011), which may be associated with psychotherapy use. These attributes – as well as personality traits – are valued differently for men and women in the labor market (Flinn et al., 2018), potentially impacting men's income progress differently than women's. In our study, only 10 % of men with sickness absence due to CMD started using psychotherapy, compared to 16 % among women. The observed difference in psychotherapy use rates in our study, along with the previous findings of Leppänen et al. (2022) indicating lower rates of psychotherapy use among men transitioning to disability pension, suggests that the men in our sample who are using psychotherapy may have the potential for improvements in work disability, employment status, and subsequently income. This hypothesis is further backed by our finding on the rather immediate impact of psychotherapy on income among men, which suggests that the use of psychotherapy among men may be more attached to success in labor market, such as finding a job, while without that success also psychotherapy is not used. Second, documented gender-related societal norms and career-related decision may play a role. In more detail, the observed differences in outcome between women and men may, to some extent, be attributed to the prominent gender gap associated with family events, especially in mid-life (Jalovaara and Fasang, 2020). On average, the participants in our study, particularly women and men who used psychotherapy, may share a similar age range, they might be in different phases of family life and career, which could manifest in our results in both the decision to use psychotherapy and the related effects. Third, the response to treatment may exhibit gender-specific characteristics. Research on socioeconomic factors and the use of psychotherapy, as well as the effects of psychotherapy on work disability, suggests that there are likely distinct usage patterns and outcomes for women and men (Leppänen et al., 2022; Selinheimo et al., 2023b). For instance, women are more inclined to use psychotherapy and tend to experience higher work disability during and after long-term psychotherapy use. Additionally, unemployed individuals are less likely to receive psychotherapy. Importantly, these factors—gender, employment status, and work disability—may all influence income. However, a more thorough investigation into potential explanations for the observed outcomes is a subject that merits further exploration.

### 4.1. Strengths

This study's strength lies in using administrative registers with a long follow-up period and a quasi-experimental design. We controlled for confounding variables linked to psychotherapy use and outcomes by weighting the data to balance treatment and control groups, addressing baseline differences. Time-fixed effects addressed shared factors, like macroeconomic conditions, affecting all participants, while individual-fixed effects controlled for participant-specific, time-invariant factors. The homogeneity of the group with work disability due to CMD further minimized confounding, clarifying the relationship between psychotherapy use and income in specific group. Gender-based stratification revealed gender-specific variations in psychotherapy's effects on income. We analyzed pre-treatment trends to support causal interpretation, confirming parallel income trends for therapy users and the control group, which mitigated concerns about pre-existing income differences and strengthened our findings. A sensitivity analysis with a control group of individuals who eventually used psychotherapy further validated our results and addressed selection bias concerns.

### 4.2. Limitations

This study has limitations. Despite using a quasi-experimental approach and comprehensive administrative registers, we must be cautious about attributing causality from the use of psychotherapy to income. Previous studies have demonstrated a correlation between income, or other income-related factors, and the likelihood of using psychotherapy in Finland (Leppänen et al., 2022; Selinheimo et al., 2023a). We cannot establish a causal relationship, for instance, where a decrease in income directly leads to psychotherapy use. However, the absence of pre-treatment trends reinforces our findings regarding the causal impact of psychotherapy use on income. We could not rule out other treatment selection factors, particularly those beyond register-accessible variables, like individual-level changes over time. Seeking psychotherapy is a personal decision, and our study design cannot fully eliminate endogeneity concerns, meaning factors might influence both psychotherapy use and income. However, our analyses suggest that alternative explanations for men's income changes would need to align with psychotherapy initiation. This study did not explore mechanisms beyond employment status and work disability to explain income differences between psychotherapy users and non-users. The severity of mental health disorders likely affects psychotherapy's duration, intensity, and income impact, but this study does not include measures related to psychotherapy's content or form. Current evidence indicates minor differences in the effects of various psychotherapeutic approaches on depression (Barth et al., 2016) and highlights the importance of common factors in therapy efficacy (Wampold, 2015), suggesting similar mechanisms drive psychotherapy effectiveness across approaches. Finally, our findings may not be generalizable beyond those who have experienced work disability due to CMD.

Future research on the labor market effects of psychotherapy should explore contextual measures in detail to gain a comprehensive understanding. Studies should focus on specific diagnoses, treatment duration and intensity, and psychotherapeutic approaches. Additionally, mechanisms beyond employment status and work disability that explain income differences between psychotherapy users and non-users should be examined, possibly using mixed methods. While this study focused on gender differences, future research should consider other socioeconomic factors, such as the interplay between gender and age, education, occupational status, and career establishment in younger individuals.

### 4.3. Clinical and societal relevance

Our findings hold significant clinical and societal relevance highlighting gender differences in mental health treatment outcomes, particularly psychotherapy. Given the pivotal role of income in societal equality, these effects could have lasting impacts. As healthcare and social security systems face budget constraints, understanding the economic impacts of mental health treatments is essential. Our study addresses an existing research gap, and the implications can inform policy decisions and scientific research. Recognizing gender-specific treatment responses can lead to more effective interventions and promote greater equity in mental health care.

## 5. Conclusion

To conclude, our study found a significant increase in post-treatment income for men who had experienced work disability due to CMD following psychotherapy. This increase was both immediate and long-lasting. Any other explanation for the increase in men's income would need to coincide with the start of psychotherapy.

### CRediT authorship contribution statement

**Jarno Turunen:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Sanna Selinheimo:** Writing – review & editing, Methodology, Funding acquisition, Conceptualization. **Kia Gluschkoff:** Writing – review & editing, Funding acquisition, Data curation, Conceptualization. **Petri Böckerman:** Writing – review & editing. **Johanna Kausto:** Writing – review & editing, Funding acquisition, Conceptualization. **Aki Koskinen:** Writing – review & editing, Funding acquisition, Data curation, Conceptualization. **Ari Väänänen:** Writing – review & editing, Project administration, Funding acquisition, Conceptualization.

### Authorship contribution statement

The study was conceptualized by JT, KG, SS, JK, AK, and AV. AV was responsible for project management. JT and AK performed the statistical analyses. JT wrote the manuscript with input and critical revisions from all the authors KG, SS, JK, AK, PB, and AV. All authors approved the final manuscript.

### Ethical standards

The ethics committee of the Finnish Institute of Occupational Health has approved the study. Data in this study were used under a license approved by Statistics Finland, the Social Security Institution of Finland, Finnish Centre for Pensions.

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### Declaration of competing interest

The authors declare no conflict of interest.

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### Appendix 1

There was a total number of 5042 individuals who started using rehabilitative psychotherapy between 2011 and 2019. Appendix Table 1 presents the annual number and percentage of individuals who started using psychotherapy, while Appendix Table 2 provides the number and percentage of individuals for each duration of psychotherapy treatment in years, as well as the average duration, separately for women and men.

**Appendix Table 1**
Annual Number and Percentage of New Psychotherapy Users, and Cumulative Sum of Annual Psychotherapy Users.

| | WOMEN, N = 3945 (100 %) | CUMULATIVE SUM | MEN, N = 1097 (100 %) | CUMULATIVE SUM |
|---|---|---|---|---|
| 2011 | 394 (11.2) | 394 | 94 (8.5) | 94 |
| 2012 | 434 (12.4) | 828 | 117 (10.7) | 214 |
| 2013 | 486 (13.9) | 1314 | 133 (12.1) | 347 |
| 2014 | 522 (14.9) | 1836 | 141 (12.8) | 488 |
| 2015 | 569 (16.2) | 2405 | 170 (15.4) | 658 |
| 2016 | 570 (16.3) | 2975 | 154 (14.0) | 812 |
| 2017 | 353 (10.1) | 3328 | 112 (10.2) | 924 |
| 2018 | 333 (9.5) | 3661 | 85 (7.7) | 1009 |
| 2019 | 284 (8.1) | 3945 | 91 (8.3) | 1097 |

**Appendix Table 2**
The Number and Percentage of Individuals for Each Duration of Psychotherapy Treatment in Years.

| | WOMEN, N = 3945 (100 %) | MEN, N = 1097 (100 %) |
|---|---|---|
| One year | 470 (11.9) | 161 (14.7) |
| Two years | 878 (22.3) | 279 (25.4) |
| Three years | 964 (24.4) | 257 (23.4) |
| Four years | 1503 (38.1) | 361 (32.9) |
| Five or more years | 130 (3.3) | 39 (3.6) |
| Average duration in years (SD) | 3.0 (1.1) | 2.9 (1.1) |

### 1.1. The main analysis

The initial count of women who did not use psychotherapy was 17,698. In 2011, there were 394 women that started to use psychotherapy. The control group comprised 17,698 women who did not use psychotherapy and 3661 women who initiated psychotherapy during years 2012–2019. Subsequently, in 2012, the treatment group saw an increase of 434 women, resulting in 828 women in the treatment group, and a combination of 17,698 women who did not use psychotherapy and 3117 women who had not yet started psychotherapy, but started it during 2013–2019 in the control group. In 2019, there were a total of 3945 women in the treatment group and 17,698 in the control group.

The initial count of men who did not use psychotherapy was 9818. In 2011, the control group comprised 9818 men who did not use psychotherapy and 1003 men who initiated psychotherapy during years 2012–2019. Subsequently, in 2012, the treatment group saw an increase of 117 men, resulting in 214 men in the treatment group and a combination of 9818 men who did not use psychotherapy and 886 men who had not yet started psychotherapy, but started it during 2013–2019 in the control group. In 2019, there were a total of 1097 men in the treatment group and 9818 in the control group.

The event-study estimates are derived from aggregating the estimates with respect to the timing of the first treatment, specifically the year in which the individual used psychotherapy for the first time. For example, in 2011, 394 women utilized psychotherapy. The year 0 estimate for them is from the year 2011, and the year −1 estimate is from the year 2010. They do not have a − 2 estimate, as our follow-up is confined to the period of 2010–2019. The year 1 estimate is derived from 2012, and the year 2 estimate from 2013, and so on, up to the year 8 estimate from 2019. For those 434 women, who used psychotherapy for the first time in 2012, the estimates are derived in similar fashion: year 0 for 2012, −1 for 2011, −2 for 2010, 1 for 2013, 2 for 2014 and 7 for 2019. This is repeated for all groups who started psychotherapy in different years. Therefore, the analysis encompasses the majority of observations for the years 0 and − 1, as these estimates encompass all individuals who initiated psychotherapy. For the aggregated estimate of year 1, there are observations from all groups who started the use of psychotherapy except for those who started in 2019. The number of observations from which the aggregated estimates are derived decreases further away from year 0, leading us to report the −5 to 4 year aggregated estimates. This provides a span of 5 years before and after treatment follow-up.

### 1.2. The sensitivity analysis

The sensitivity analysis includes only individuals who initially began using psychotherapy between 2011 and 2019. Consequently, the control group comprises individuals who had not yet initiated psychotherapy but eventually did so.

In 2011, there were 394 women that started to use psychotherapy. The control group included 3551 women who initiated psychotherapy during years 2012–2019. Subsequently, in 2012, the treatment group saw an increase of 434 women, resulting in control group of 3117 women who had not yet started psychotherapy, but started it during 2013–2019. In 2019, there were no-one in the control group.

In 2011, there were 94 men that started to use psychotherapy. The control group included 1003 men who initiated psychotherapy during years 2012–2019. Subsequently, in 2012, the treatment group saw an increase of 117 men, resulting in control group of 886 men who had not yet started psychotherapy, but started it during 2013–2019. In 2019, there were no-one in the control group.

The aggregation of event-study estimates was carried out using a similar approach as detailed previously.

## Appendix 2

Eq. A1 provides an estimate for the effect of psychotherapy use on income employing difference-in-differences event-study framework using weighted least squares regression

$$log\left(y_{i,t}\right) = x'_{i,t} + \alpha_i + \theta_t + \sum_{k}^{-1} \omega_k D_{i,t} + \sum_{0}^{l} \beta_k D_{i,t}^k + u_{i,t} \tag{A1}$$

where $log\left(y_{i,t}\right)$ is the estimated logarithm of income for individual i in during time t, $x'_{i,t}$ contains independent level time-varying covariates for individual i during time t, $\alpha_i$ represents individual fixed effects unique for each individual and $\theta_t$ represents time fixed effects common for all individuals. $\omega_k D_{i,t}$ and $\beta_k D_{i,t}^k$ represent the effects of psychotherapy use before and after the use for each time point t, respectively. In more detail, the former represents pre-treatment effects and the latter post-treatment effects. The error term $u_{i,t}$ includes the individual level standard errors. Thus, the variable of interest is $D_{i,t}^k$ which depicts the treatment effect of psychotherapy use, relative to the timing of the treatment.

The estimator uses inverse probability weighting of conditional propensity score of being treated. In more detail, the baseline values from the year 2010 are used to estimate the propensity score for belonging to the treatment group. The propensity score is used in inverse probability weighting to weight the control group to exactly match the treatment group regarding the variables used in estimation. This mimics a randomization. As a result of weighting the treatment group and the control group are perfectly balanced on the covariates included in the model.

The covariates $x'_{i,t}$ used in our regression model included age, educational attainment (categorized into three levels, which were low, secondary, and higher), employment status (four levels which were employed, unemployed, student, outside of the workforce for other reasons), the first year with sickness absence due to F32–33 or F40–43 -diagnoses (ranging from 2011 to 2015), and an annual dummy variable for F32-F33 diagnoses related sickness absence (two levels: 0 if no sickness absence due to F32-F33 or 1 if there was sickness absence due to F32-F33 given year), the collaborative areas for healthcare around five university hospital areas in Finland: southern (Helsinki University Hospital), central (Tampere University Hospital), western (Turku University Hospital), eastern (Kuopio University Hospital), and northern (Oulu University Hospital), and the measures of. unemployment months and disability months due to any diagnoses.

The absence of multicollinearity among the covariates was evaluated by calculating the Variance Inflation Factor for each covariate.

## Appendix 3

Appendix Tables 3 and 4 present the employment status and the total annual disability months for each follow-up year for the treatment and control groups, separately for women and men, respectively. Appendix Table 5 includes the information of the first year of CMD-diagnosis for the treatment and control groups.

**Appendix Table 3**
The Employment Status of the Treatment and Control Groups for Each Follow-Up Year, Separately for Women and Men. The symbols W* and M* denote statistically significant differences in the frequencies between the treatment and control groups, as determined by a chi-squared test for women and men, respectively.

| | | WOMEN | | MEN | |
|---|---|---|---|---|---|
| | | PSYCHOTHERAPY USE (N = 3495) | CONTROL (*N* = 17,698) | PSYCHOTHERAPY USE (N = 1097) | CONTROL (N = 9818) |
| Employment status %, 2010 | | | | | |
| W*, M* | Employed | 74.30 | 79.3 | 72.7 | 74.4 |
| | Unemployed | 5.7 | 7.8 | 6.6 | 12.3 |
| | Student | 15.5 | 7.9 | 16.9 | 7.9 |
| | Outside Workforce for different reasons | 4.5 | 5.0 | 3.8 | 5.4 |
| Employment status %, 2011 | | | | | |
| W*, M* | Employed | 76.4 | 81.8 | 73.7 | 75.6 |
| | Unemployed | 5.5 | 7.3 | 6.6 | 11.4 |
| | Student | 13.9 | 5.9 | 14.2 | 6.1 |
| | Outside Workforce for different reasons | 4.3 | 5.1 | 5.6 | 6.9 |
| Employment status %, 2012 | | | | | |
| W*. M* | Employed | 75.6 | 81.0 | 71.7 | 72.8 |
| | Unemployed | 6.5 | 8.4 | 7.8 | 13.8 |
| | Student | 12.9 | 5.4 | 13.4 | 5.8 |
| | Outside Workforce for different reasons | 5.0 | 5.2 | 7.1 | 7.6 |
| Employment status %, 2013 | | | | | |
| W*. M* | Employed | 73.2 | 78.8 | 70.0 | 68.5 |
| | Unemployed | 8.4 | 10.2 | 9.0 | 16.6 |
| | Student | 12.0 | 4.7 | 12.8 | 5.6 |
| | Outside Workforce for different reasons | 6.4 | 6.3 | 8.2 | 9.3 |
| Employment status %, 2014 | | | | | |
| W*, M* | Employed | 71.8 | 76.1 | 66.1 | 64.8 |
| | Unemployed | 10.0 | 11.8 | 11.4 | 18.4 |
| | Student | 11.2 | 4.7 | 12.9 | 5.3 |
| | Outside Workforce for different reasons | 7.0 | 7.4 | 9.7 | 11.6 |
| Employment status %, 2015 | | | | | |
| W*, M* | Employed | 69.8 | 73.6 | 62.7 | 61.6 |
| | Unemployed | 11.1 | 13.2 | 12.6 | 20.5 |
| | Student | 10.6 | 4.7 | 12.5 | 5.1 |
| | Outside Workforce for different reasons | 8.5 | 8.5 | 12.2 | 12.9 |
| Employment status %, 2016 | | | | | |
| W*, M* | Employed | 68.5 | 72.9 | 63.0 | 60.9 |
| | Unemployed | 11.7 | 13.3 | 14.3 | 20.4 |
| | Student | 10.5 | 4.4 | 10.5 | 5.0 |
| | Outside Workforce for different reasons | 9.3 | 9.4 | 12.1 | 13.8 |
| Employment status %, 2017 | | | | | |
| W*, M* | Employed | 69.8 | 73.9 | 65.5 | 62.8 |
| | Unemployed | 10.2 | 11.4 | 11.3 | 16.8 |
| | Student | 9.6 | 3.9 | 9.3 | 4.5 |
| | Outside Workforce for different reasons | 10.5 | 10.8 | 14.0 | 15.9 |
| Employment status %, 2018 | | | | | |
| W*, M* | Employed | 71.5 | 74.3 | 65.4 | 63.5 |
| | Unemployed | 8.5 | 9.7 | 11.7 | 15.3 |
| | Student | 8.0 | 3.5 | 7.9 | 3.8 |
| | Outside Workforce for different reasons | 12.0 | 12.5 | 15.0 | 17.4 |
| Employment status %, 2019 | | | | | |
| W*, M* | Employed | 70.9 | 72.9 | 66.3 | 62.6 |
| | Unemployed | 8.5 | 9.2 | 10.6 | 14.8 |

(*continued on next page*)

**Appendix Table 3** (*continued*)

| | | WOMEN | | MEN | |
|---|---|---|---|---|---|
| | | PSYCHOTHERAPY USE (N = 3495) | CONTROL (*N* = 17,698) | PSYCHOTHERAPY USE (N = 1097) | CONTROL (N = 9818) |
| | Student | 7.8 | 3.4 | 6.9 | 3.6 |
| | Outside Workforce for different reasons | 12.9 | 14.5 | 16.2 | 19.0 |

**Appendix Table 4**

The Total Annual Disability Months for Each Follow-Up Year, Separately for Women and Men in the Treatment and Control Groups. The symbols W* and M* denote statistically significant differences in the annual disability months between the treatment and control groups, determined by a t-test, for women and men, respectively.

| | WOMEN | | MEN | |
|---|---|---|---|---|
| Average annual disability months (SD) | PSYCHOTHERAPY USE (N = 3945) | CONTROL (N = 17,698) | PSYCHOTHERAPY USE (N = 1097) | CONTROL (N = 9818) |
| 2010 W*, M* | 0.2 (0.8) | 0.2 (0.9) | 0.1 (0.8) | 0.2 (1.0) |
| 2011 W*, M* | 0.8 (1.8) | 0.7 (1.6) | 0.9 (2.1) | 0.7 (1.8) |
| 2012 W*, M* | 0.9 (2.0) | 1.2 (2.5) | 1.4 (2.7) | 1.1 (2.4) |
| 2013 W*, M* | 1.4 (2.8) | 1.0 (2.3) | 1.5 (3.0) | 1.3 (2.7) |
| 2014 W*, M* | 1.8 (2.7) | 1.2 (2.6) | 2.0 (3.4) | 1.5 (3.0) |
| 2015 W*, M* | 2.2 (3.5) | 1.4 (2.9) | 2.3 (3.7) | 1.7 (3.3) |
| 2016 W*, M* | 2.0 (3.6) | 1.2 (3.0) | 2.0 (3.8) | 1.5 (3.4) |
| 2017 W*, M* | 1.9 (3.7) | 1.2 (3.0) | 2.0 (3.9) | 1.4 (3.5) |
| 2018 W*, M* | 2.0 (3.9) | 1.3 (3.2) | 2.0 (3.9) | 1.5 (3.5) |
| 2019 W*, M* | 2.0 (4.0) | 1.3 (3.2) | 2.0 (4.0) | 1.5 (3.5) |

**Appendix Table 5**

The First Year of CMD-Diagnosis for the Treatment and Control Groups. Statistical significance was determined by a chi-squared test.

| | | WOMEN (N = 21,643) | | | MEN (N = 10,915) | | |
|---|---|---|---|---|---|---|---|
| | | Psychotherapy use (N = 3945) | Control (N = 17,698) | P-value for difference | Psychotherapy use (N = 1097) | Control (N = 9818) | P-value for difference |
| The year of the first F32–33- or F40–43-diagnosis, % | | | | 0.001 | | | 0.016 |
| | 2011 | 22.5 | 20.6 | | 23.3 | 21.7 | |
| | 2012 | 20.5 | 20.1 | | 18.8 | 20.5 | |
| | 2013 | 19.3 | 18.6 | | 16.1 | 19.6 | |
| | 2014 | 20.1 | 20.4 | | 21.9 | 20.1 | |
| | 2015 | 17.7 | 20.3 | | 19.9 | 18.1 | |

**Appendix Table 6**

Percentage of individuals on sickness absence due to F32-F33 or F40-F43 diagnosis in the treatment and control groups. The statistical significance of the differences in the percentage between the treatment and control groups was determined by a t-test, separately for women and men.

| | | WOMEN (N = 21,643) | | | MEN (N = 10,915) | | |
|---|---|---|---|---|---|---|---|
| | | Psychotherapy use (N = 3945) | Control (N = 17,698) | P-value for difference | Psychotherapy use (N = 1097) | Control (N = 9818) | P-value for difference |
| F32-F33 Diagnosis | | | | | | | |
| | 2011 | 12.0 | 10.2 | <0.001 | 13.9 | 11.1 | 0.005 |
| | 2012 | 20.8 | 15.4 | <0.001 | 19.4 | 17.3 | 0.08 |
| | 2013 | 19.9 | 14.5 | <0.001 | 19.1 | 16.5 | 0.03 |
| | 2014 | 23.9 | 15.2 | <0.001 | 25.0 | 17.7 | <0.001 |
| | 2015 | 26.9 | 15.4 | <0.001 | 27.1 | 18.5 | <0.001 |
| | 2016 | 17.8 | 7.2 | <0.001 | 17.1 | 8.5 | <0.001 |
| | 2017 | 13.2 | 4.6 | <0.001 | 13.0 | 3.9 | <0.001 |

(*continued on next page*)

**Appendix Table 6** (*continued*)

| | | WOMEN (N = 21,643) | | | MEN (N = 10,915) | | |
|---|---|---|---|---|---|---|---|
| | | Psychotherapy use (N = 3945) | Control (N = 17,698) | P-value for difference | Psychotherapy use (N = 1097) | Control (N = 9818) | P-value for difference |
| | 2018 | 12.3 | 4.5 | <0.001 | 11.3 | 3.8 | <0.001 |
| | 2019 | 11.0 | 4.4 | <0.001 | 9.1 | 3.6 | <0.001 |
| F40-F43 Diagnosis | | | | | | | |
| | 2011 | 5.8 | 8.5 | <0.001 | 6.0 | 6.8 | 0.34 |
| | 2012 | 8.8 | 11.5 | <0.001 | 9.3 | 10.1 | 0.40 |
| | 2013 | 9.7 | 11.8 | <0.001 | 9.0 | 10.3 | 0.17 |
| | 2014 | 12.0 | 13.1 | 0.07 | 11.2 | 10.8 | 0.66 |
| | 2015 | 13.1 | 12.6 | 0.37 | 12.2 | 10.5 | 0.08 |
| | 2016 | 7.2 | 4.3 | <0.001 | 5.0 | 3.5 | 0.01 |
| | 2017 | 5.2 | 2.8 | <0.001 | 3.8 | 1.6 | <0.001 |
| | 2018 | 4.7 | 2.7 | <0.001 | 4.3 | 1.7 | <0.001 |
| | 2019 | 5.7 | 3.2 | <0.001 | 4.6 | 1.7 | <0.001 |

## Appendix 4

The estimated effects from the analysis using only individuals who started using psychotherapy during 2011–2019. See Appendices 2 and 3 for more information on the treatment and control groups in this research design.

The estimated pre-treatment effects for both women and men in the study sample of psychotherapy users were near zero and non-significant, indicating that the parallel trends assumption holds (Appendix Table 6). Specifically, the estimated average treatment effects for the pre-treatment period were close to 0 % for women (Average effect: 0.02 with 95 % CI: −0.01 − 0.05), and men (Average effect: −0.05 with 95 % CI: −0.11 − 0.01). The estimated average post-treatment effect was negative and statistically non-significant for women (Average effect: −0.05 with 95 % CI: −0.12 − 0.01), and positive and statistically significant for men (Average effect: 0.30 with 95 % CI: 0.09–0.51) for men.

Appendix Table 6 shows the results in more detail for five years before and after the treatment. Specifically, the estimated dynamic effects for both women and men were larger in magnitude compared to the estimates from the main analysis. The estimated effects for women were slightly more negative compared to the estimates from the regression analysis using different control group. During third and fourth year after the start of psychotherapy use, the estimated effect on income was negative, −0.10 (95%CI: −0.20− −0.01) and − 0.11 (95%CI: −0.22− −0.01), indicating a 10 and 11 % decrease in income, respectively.

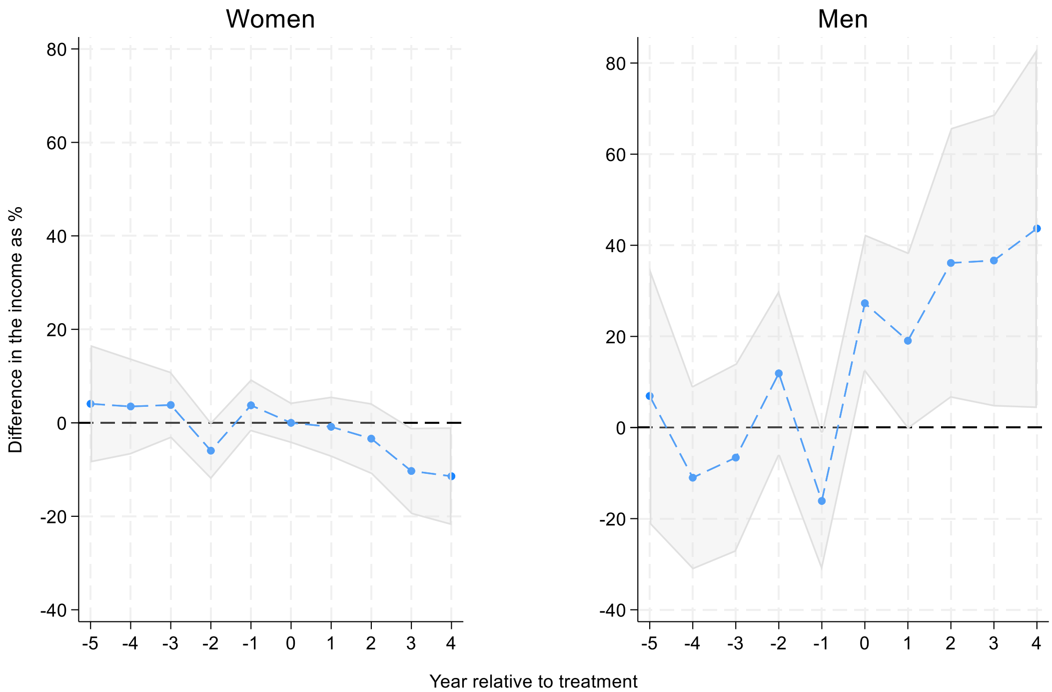
A pre-treatment dip observed in income was observed for men one year before the start of psychotherapy use (−0.16 with 95 % CI: −0.31− −0.01). The estimated post-treatment effects for men showed a similar pattern to those obtained from the main analysis.

**Appendix Table 7**
The Estimated Dynamic Pre- and Post-Treatment Effects, Along with 95 % Confidence Intervals, on the Logarithm of Income for Both Women and Men who Initiated Psychotherapy. The Control Group Comprises Individuals who have Not Yet Commenced Psychotherapy.

| WOMEN | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pre-treatment period | | | | | Post-treatment period | | | | |
| Average effect: 0.02 (−0.01–0.05) | | | | | Average effect: −0.05 (−0.12–0.01) | | | | |
| Year T-5 | Year T-4 | Year T-3 | Year T-2 | Year T-1 | Year T 0 | Year T + 1 | Year Y + 2 | Year T + 3 | Year T + 4 |
| 0.04 (−0.08–0.17) | 0.04 (−0.07–0.14) | 0.04 (−0.03–0.11) | −0.06 (−0.12–0.00) | 0.04 (−0.02–0.09) | 0.00 (−0.04–0.04) | −0.01 (−0.07–0.06) | −0.03 (−0.11–0.04) | **−0.10 (−0.20− −0.01)** | **−0.11 (−0.22–0.01)** |

| MEN | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pre-treatment period | | | | | Post-treatment period | | | | |
| Average effect −0.05 (−0.11–0.01) | | | | | Average effect **0.30 (0.09–0.51)** | | | | |
| Year T-5 | Year T-4 | Year T-3 | Year T-2 | Year T-1 | Year T 0 | Year T + 1 | Year Y + 2 | Year T + 3 | Year T + 4 |
| 0.07 (−0.21–0.35) | −0.11 (−0.31–0.09) | −0.07 (−0.28–0.14) | 0.11 (−0.06–0.30) | **−0.16 (−0.31− −0.01)** | **0.27 (0.12–0.42)** | 0.19 (−0.00–0.38) | **0.36 (0.07–0.66)** | **0.37 (0.05–0.69)** | **0.44 (0.04–0.83)** |

Note iii. The analysis is based on difference-in-differences regression using event-study design and includes separate analysis for women (N = 3945) and men (N = 1097). Year T 0 depicts the first year of psychotherapy use. The cells display the estimated dynamic effect along with the corresponding 95 % Confidence Interval in parentheses. The logarithms of income reflect the percentage difference in income between the treatment and control groups. A value of −0.04 indicates a negative 4 % difference in the income evolution between the two groups. Statistically significant effects have been bolded. The annual numbers of individuals in the treatment and control group are described in more detail in Appendix *1*. The estimation is described in more detail in Appendix *2*.




**Appendix Fig. 1.** The Estimated Dynamic Pre- and Post-Treatment Effect of Psychotherapy Use on Income for Both Women and Men who Initiated Psychotherapy between 2011 and 2019. The Control Group Comprises Individuals who have Not Yet Commenced Psychotherapy. The Y-axis Represents the Percentual Difference in Income Between the Treatment and Control Groups, while the X-axis Indicates the Year Relative to the First Psychotherapy Use. The blue line depicts the estimated effect, and the grey area depicts the 95 % confidence interval for the estimate. Additional details on the annual numbers of individuals in the treatment and control group can be found in Appendix 1, and further information on the estimation process is provided in Appendix 2.

## Data availability

The data are not publicly available. The Finnish Social and Health Data Permit Authority (Findata) coordinates the permissions for similar datasets, and they are available to researchers under permission (https://findata.fi/en/).

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