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# Recurrent major depression, employment and transitions to unemployment and disability benefits

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## ABSTRACT

This study assesses the effects of recurrent major depression on employment and transitions to unemployment and disability benefits. Examining this issue is essential for designing timely interventions aimed to sustain individuals' employment. We rely on register data of a sample of individuals initially employed—a 2% sample of employees representative of French private-sector employees—followed up to eight years before and eight years after the year of diagnosis, aged between 20 and 60 years, over the period 2000–2015. We estimate that recurrent major depression persistently decreases the likelihood of being employed by 35 percentage points and annual earnings by 51%, and leads to increase the probability of long absence by 47 percentage points and the probability of permanent disability benefit reciprocity by 33 percentage points. The effect sizes are similar between men and women. We find differences between age groups. For young and middle-aged individuals, recurrent major depression implies a decrease in employment rates, an increase in unemployment benefit rates and a persistent increase in disability benefit reciprocity rates. Many young ill individuals remain attached to the labor market but experience unemployment and a large decline in annual earnings. For older individuals, recurrent major depression leads to a larger decrease in employment rates and a greater increase in disability benefit reciprocity rates, compared to younger individuals. We conclude that differentiated policies tailored to age groups might be developed to support the employment of individuals with recurrent major depression.

## 1. Introduction

Major depression is among the leading contributors to the chronic disease burden worldwide, accounting for 5.6% of all years lived with disability (WHO, 2022). Its manifestations include persistent poor mood, anhedonia, sadness, feelings of hopelessness, suicidal ideation, irritability, slow movement or speech, sleep disturbance, changes in appetite, and loss of energy, as well as difficulties concentrating, making decisions or remembering information. Major depression affects 6% of the adult population each year, while its lifetime prevalence is estimated at 10% (Scott et al., 2018). The literature suggests that mental illnesses, including major depressive disorders, have important negative impacts on individuals' labor market outcomes (Chatterji et al., 2011; Frijters et al., 2014; Peng et al., 2016; Banerjee et al., 2017; Bubonya et al., 2019; Diby et al., 2021). It is also well established that people with severe mental disorders, identified through psychiatric diagnoses during hospital admissions, in adolescence or adulthood, have low employment rates and earnings over the course of their life (e.g., Hakulinen et al., 2019a; Hakulinen et al., 2019b; Biasi et al., 2021; Eliason, 2023).

In the literature, studies focus on major depression often identified during the manifestation of symptoms without considering the recurrent nature of the illness. Little is known about the effects of repeated episodes of major depression on individuals' labor market outcomes. However, the recurrence of the illness may lead to more significant negative consequences than might a single, isolated episode. It is estimated that at least 50% of people with major depressive disorders experience repeated episodes over the course of their life. The risk of recurrence increases progressively with each episode and recurrent severe depressions are associated with greater impairments in memory performance and cognitive function (Solomon et al., 2000; Gorwood et al., 2008; Kriesche et al., 2023). Thus, we can expect strong negative consequences of recurrent major depressive disorders for individuals' employment and earnings. Few studies have examined this issue. The literature suggests that the impacts of major depression in early adulthood on labor market outcomes at a later age are partly due to the recurrence of the illness (Hakulinen et al., 2019a; Wang et al., 2023).

Our study contributes to previous research by estimating the effects of diagnosed recurrent major depression of individuals initially in

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employment on their subsequent labor market outcomes. Based on register data, we identify individuals diagnosed with recurrent major depression characterized by at least three recurrences. Our methodology relies on an event-study approach. The data consist of a panel sample of French employees followed eight years before and eight years after the diagnosis. We estimate the effects of recurrent major depression on several outcomes, including employment rates and annual earnings. We also examine the effects on the transitions to unemployment and disability benefits to explore the extent to which individuals remain in or exit the labor market. The event-study approach enables us to examine the timing of the effects and to discuss how and when policy makers could set interventions to prevent and reduce the economic and well-being consequences of recurrent major depression.

We estimate these effects by gender, as different effect sizes between men and women might be expected. If the severity of recurrent major depression is higher for women than for men, one may expect larger effects for women. One may also expect important differences between age groups. The effects on employment of individuals at an early age, during the development of their career, might be considerable and might reduce future employment opportunities and lead to a lack of employment stability or to inactivity. These effects may not resorb and may persist throughout their subsequent career. For older individuals, the episodes of major depression might be more persistent and severe than for younger individuals (Penninx et al., 2011), which could result in large effects on their probability of employment and earnings.

Depressive disorders are growing, particularly among young people (Krokstad et al., 2022). Formulating adequate and timely policies to prevent severe depression and to improve the economic and social conditions of affected people is an important challenge (OECD, 2015). Furthermore, developing such policies is crucial in a context of growing constraints on public finance. Depressive disorders account for a significant share of social benefits and health expenditures, including healthcare expenditures and disability benefit expenditures. Evaluating the effects of recurrent major depression on labor market outcomes is particularly valuable for designing timely interventions aimed at sustaining the employment of affected individuals.

## 2. Data and empirical strategy

### 2.1. Data

We use the French database *Hygie*, which links register data of the *Statutory Health Insurance* (SHI) fund to register data of the *Social Security Retirement Pension* fund. This database is composed of a 2% sample of employees drawn from the register data of the French *Social Security Retirement Pension* fund. This sample is representative of private-sector employees. These data provide information on the career outcomes of individuals over the period 2000–2015. SHI data have been matched to this sample through the unique identifiers of individuals.

The authorization to access the data was obtained from the French data protection authority (authorization CNIL DE-2006-238/1185212). No informed consent was required from individuals as this research does not involve human experimentation and as the analyzed data are pseudonymized.

### 2.2. Recurrent major depression

The SHI data provide information on individuals included in the long-term illness (LTI) scheme of the French SHI system. The beneficiaries of this scheme are individuals receiving medical treatment for an LTI. The most frequent LTI are cancers, diabetes, mental disorders and cardiovascular diseases (Païta et al., 2016). The patients included in the LTI scheme benefit from reduced copayments for medical care related to their LTI. They also benefit from an extension of the eligibility duration to temporary disability benefits for work absences related to their LTI. Specifically, for employees included in the LTI scheme, the maximum

duration is three years, while for those without LTI the maximum duration is 360 days over a period of three consecutive years.

The data indicate the year of entry into the LTI scheme and the diagnosed disease. We focus on individuals entering the LTI scheme with a diagnosis of recurrent major depression. We identify illnesses with the codes F32 and F33 of the tenth version of the International Classification of Diseases (ICD-10).

The claim to enter the LTI scheme is managed by the referring physician in charge of the regular medical follow-up of the patient. To be included, the patient must have had at least three identified episodes of major depression over a period of one year or more (Haute Autorité de Santé, 2012). Thus, the entry into the LTI scheme is not concomitant with the first manifestation of the illness; rather, it corresponds to the onset of the diagnosed recurrence and persistence of the disorder.

In the claim, the referring physician provides the planned mental healthcare protocol, which details the medical care for the patient, typically including antidepressant medication and psychotherapy. We note that it does not include any guidance on employment support to improve prospects to return to work. The protocol must be validated and accepted by a physician of the SHI fund, who is allowed to review the patient's healthcare consumption data and ask the referring physician further questions. A claim may be accepted or rejected; approximately 8% of claims for mental disorders are rejected (Cour des Comptes, 2016). The SHI physician must decide to accept or reject the claim within a few weeks.

### 2.3. Labor market outcomes

We study several outcomes of interest. The binary variable '*employment*' indicates the employment status of the individual, taking the value of 1 if he or she has private-sector wage earnings of at least 150 hours of the minimum wage during the year and does not receive unemployment or disability benefits during the year; 0 otherwise.

The variable '*annual earnings*' represents the annual gross wage earned by the individual as private-sector employee; it takes the value of 0 if the individual has no annual earnings.

The binary variable labeled '*long sickness absence*' indicates whether the individual has long work absences, i.e., having at least 60 days of temporary disability benefits in a year.

The binary variable '*unemployment*' indicates whether the individual has at least 50 days of unemployment benefits in a year.

The binary variable '*disability*' indicates the reciprocity of permanent disability benefits in a year. It corresponds to receiving an SHI permanent disability pension for a loss of at least two-thirds of one's work ability. The disability pension amounts in general to 50% of the mean annual salary earned in the past 10 years of individuals' working life.

In addition, the binary variable '*other employment status*' indicates whether the individual has periods validated in another regime as civil servants, agricultural workers or self-employed workers in a year. This concerns a small number of individuals in our study population since the annual flow of private-sector employees to these other regimes is somewhat small (less than 1% per year).

### 2.4. Groups and periods of interest

The treatment group includes individuals aged between 25 and 60 years who entered the LTI scheme for recurrent major depression during the period 2004–2011. The subscript  $t$  denotes years relative to the entry year, with  $t = 0$  being the entry year, corresponding to a year between 2004 and 2011. We observe outcomes up to eight years before and up to eight years after the entry year. The outcomes are available from 2000 to 2015. Thus this 16-year period enables us to observe these outcomes during a maximum of 11 years before and 11 years after the entry year 0. However, for the present study, to have enough observations per relative year, we restrict the period to eight years before the entry year 0 and eight years after the entry year 0.

We define three periods: the *inclusion period* including the years  $-1$  and  $0$ , which encompasses the one-year period during which the illness is identified as recurrent and the year of entry in the LTI scheme; the *pre inclusion period* including the years between  $-8$  and  $-2$ ; and the *post inclusion period* including the years between  $1$  and  $8$ .

We select individuals initially attached to employment. Specifically, the sample is restricted to individuals who are employed in year  $-2$ . Furthermore, we restrict the sample to individuals without LTIs other than recurrent major depression and without permanent disability benefits before or during the *inclusion period*. This restriction aims to limit the potential bias due to confounding effects of comorbidities on

outcomes. In total, the treatment group includes 1,443 individuals who are employed in year  $-2$  and who enter the LTI scheme for recurrent major depression in year  $0$ .

We construct the control group as follows. We select individuals aged between 20 and 60 years, employed in year  $-2$ , without permanent disability benefit reciprocity and without an LTI before or during the *inclusion period*. To limit the calculation time, we reduce the number of observations in the control group to a 10% random sample.

Table 1 Panel A presents the number of observations of the two groups throughout the relative years. There is no attrition between years  $-4$  and  $0$  because all individuals are observed for at least four years

**Table 1**  
Summary statistics

Panel A: Number of observations by relative year										
		Relative year t			D = 1			D = 0		
<i>Pre inclusion period</i>		-8			784			120,308		
		-7			957			155,116		
		-6			1,098			192,381		
		-5			1,263			230,874		
		-4			1,443			268,930		
		-3			1,443			268,930		
<i>Inclusion period</i>		-2			1,443			268,930		
		-1			1,443			268,930		
<i>Post inclusion period</i>		0			1,443			268,930		
		1			1,428			265,338		
		2			1,376			260,834		
		3			1,322			255,797		
		4			1,275			250,507		
		5			1,054			213,388		
		6			820			177,317		
		7			628			142,472		
	8			461			112,102			

Panel B: Summary statistics for the two groups before and after matching										
Matching variables		t = -2			t = 4			t = 8		
		D = 1	D = 0	Diff.	D = 1	D = 0	Diff.	D = 1	D = 0	Diff.
Men	UM	0.335	0.542	-0.207***	0.339	0.543	-0.204***	0.375	0.540	-0.165***
	M	0.327	0.327	0	0.332	0.333	-0.001	0.371	0.372	-0.001
Age t = -2	UM	40.12	36.13	3.99***	46.65	42.86	3.79***	50.56	47.17	3.39***
	M	40.08	39.96	0.11	46.59	46.41	0.18	50.55	50.58	-0.03
Annual earnings t = -2: quartile 1	UM	0.337	0.249	0.087***	0.343	0.249	0.094***	0.397	0.264	0.133***
	M	0.331	0.331	0	0.338	0.337	0.001	0.397	0.394	0.003
Annual earnings t = -2: quartile 2	UM	0.299	0.249	0.050***	0.297	0.249	0.047***	0.299	0.273	0.026
	M	0.304	0.304	0	0.301	0.302	-0.001	0.300	0.296	0.004
Annual earnings t = -2: quartile 3	UM	0.228	0.250	-0.022*	0.222	0.250	-0.027**	0.193	0.241	-0.048***
	M	0.231	0.231	0	0.225	0.225	0	0.194	0.199	-0.005
Annual earnings t = -2: quartile 4	UM	0.135	0.251	-0.116***	0.137	0.251	-0.114***	0.334	0.222	-0.112***
	M	0.134	0.134	0	0.136	0.136	0	0.113	0.111	-0.002
Employment t = -4	UM	0.877	0.888	-0.11	0.867	0.884	-0.016*	0.860	0.876	-0.008
	M	0.884	0.884	0	0.875	0.877	-0.002	0.877	0.878	-0.001
Employment t = -3	UM	0.925	0.928	-0.003	0.918	0.925	-0.006	0.916	0.919	-0.003
	M	0.929	0.929	0	0.923	0.923	0	0.920	0.920	0.000
Unemployment t = -4	UM	0.179	0.136	0.042***	0.191	0.139	0.051***	0.193	0.147	0.046**
	M	0.164	0.164	0	0.174	0.174	0.001	0.185	0.189	-0.004
Unemployment t = -3	UM	0.167	0.133	0.034***	0.174	0.136	0.039***	0.166	0.146	0.020
	M	0.154	0.154	0	0.162	0.161	0.001	0.140	0.143	-0.003
Unemployment t = -2	UM	0.159	0.130	0.029***	0.164	0.131	0.033***	0.210	0.154	0.056***
	M	0.149	0.149	0	0.155	0.152	0.003	0.205	0.207	-0.002
Number of observations	UM	1,443	268,930		1,275	250,507		461	112,102	
	M	1,430	156,954		1,264	145,478		455	58,797	

**Notes:**

Panel A reports the number of observations per year for the two groups.

(D = 1) is the group of individuals employed in the year t = -2 who enter the LTI scheme at year t = 0 with a diagnosis of recurrent major depression.

(D = 0) is the control group of individuals employed in the year t = -2 who do not enter the LTI scheme.

Panel B reports the summary statistics for the two groups according to CEM variables before and after CEM weighting, for the relative time t = -2, t = 4 and t = 8. The variables used for CEM are age, gender, annual earnings in year -2 by quartile, as well as employment and unemployment in years -4, -3 and -2. The definition of the variables annual earnings, employment and unemployment is displayed in Subsection 2.3.

UM (unmatched): before CEM weighting.

M (matched): after CEM weighting.

Significance level: \*\*\*: p < 0.01; \*\*: p < 0.05; \*: p < 0.1.

before the year of entry into the LTI scheme. There is a small attrition between years 1 and 4 because some individuals pass the age of 60 years and because, to a lesser extent, some individuals die. We stress that, in this study, we focus on individuals aged between 20 and 60 years. The study does not include the scope of older individuals.

Table 1 Panel B reports summary statistics showing the differences between the two groups, before applying the matching used for estimations (presented in Subsection 2.5). The individuals with recurrent major depression are older than those without recurrent major depression. They are aged 40 years on average (in year  $-2$ ), whereas employees without recurrent major depression are aged 36 years on average. We find a lower proportion of men among employees with a diagnosis of recurrent major depression: 33.5% versus 54.2% in the control group. We note that the employment rates before the year of reference  $-2$  (in years  $-4$  and  $-3$ ) are similar between the two groups. However, the groups differ in terms of past annual earnings and past unemployment benefit reciprocity rates. Individuals with recurrent major depression have lower earnings and higher unemployment benefit reciprocity rates before the year  $-2$ .

### 2.5. Event-study regression combined with coarsened exact matching

To assess the effects of recurrent major depression on individuals' labor market outcomes, we rely on an event-study regression combined with coarsened exact matching (CEM) (for an application of this method, see for example Jeon, 2017).

CEM aims to make the two groups comparable in terms of observable covariates (Iacus et al., 2011). This matching method is adapted in the current study because the number of observations in the control group is sufficiently large to enable us to apply a precise matching on the basis of the interactions between covariates, with only a small loss of observations in the treated group due to unmatched individuals. The variables used for CEM are *age*, *gender*, *annual earnings* in year  $-2$  (in four groups defined according to earning quartiles at year  $-2$ ), and *employment* and *unemployment* in years  $-4$ ,  $-3$  and  $-2$ . According to the CEM results, 1,430 individuals in the treatment group are matched to individuals in the control group and thus included for estimations (out of 1,443 individuals before matching). Table 1 Panel B reports the summary statistics for the treatment and control groups according to the matching variables before and after applying CEM.

We estimate the effects of recurrent major depression on individuals' labor market outcomes by relying on an event-study regression model

$$Y_{it} = \alpha_i + \sum_{r=-8}^{+8} \gamma_r I_{r=t} + \sum_{r=-8}^{+8} \beta_r I_{r=t} D_i + \epsilon_{it}$$

$r \neq -2$                        $r \neq -2$

where  $Y_{it}$  is the outcome for individual  $i$  in year  $t$ ;  $D_i$  is a binary variable taking the value of 1 for individuals who enter the LTI scheme with recurrent major depression and 0 for individuals who do not;  $I_{r=t}$  are year dummies;  $\alpha_i$  is the individual fixed effect; and  $\epsilon_{it}$  is the residual term. The coefficients  $\beta$  represent the effects of recurrent major depression on the outcomes. The reference year in this regression is the year  $t=-2$ , i.e., two years before the year of entry into the LTI scheme. The regression is weighted by the CEM weights.

The identification of causal effects relies on the validity of the parallel trends assumption within each CEM stratum. The CEM strata are obtained from the interactions between covariates. The assumption is that, in the absence of treatment, the two groups have similar outcome trends within each CEM stratum. This assumption implies that there is no reverse effect of the outcomes on entry into the LTI scheme and that there is no confounding factor correlated with outcome trajectories and entry into the LTI scheme. We discuss the validity of this assumption in the next section.

## 3. Results

### 3.1. Descriptive trends

The descriptive statistics presented in Fig. 1 show the outcome trends of the two groups before matching. The figure suggests parallel trends in the *pre inclusion period*. In the *inclusion period*, the figure shows a strong increase in the rates of long absence and a decrease in annual earnings for individuals with recurrent major depression, compared with the control group. Then, in the *post inclusion period*, their employment rates and annual earnings sharply decrease. During this period, individuals shift largely to long work absences and then to permanent disability benefits.

### 3.2. Event-study regression results

Fig. 2 presents the results of the event-study regression for the full period, i.e., from year  $-8$  to year 8. Table 2 reports these coefficients only for the *pre inclusion period* (years  $-1$  and 0) and for the *post inclusion period* (from year 1 to year 8). The coefficient for each year  $t$  is interpreted as the effect in year  $t$  of recurrent major depression on the outcome trend.

The results show a period of transition between  $-2$  and 4. During these years, the rates of long absence of individuals with recurrent major depression sharply increase (+47 percentage points in year 0 compared to the control group) and then decrease. Recurrent major depression also increases the rates of unemployment benefit reciprocity (+5 percentage points in year 2). Concomitantly, employment rates decline by 35 percentage points. The results show a large transition to disability benefit receipt (+33 percentage points). This finding indicates that the main employment exit route for individuals with recurrent major depression is long absences, followed by permanent disability benefits, rather than unemployment benefits. The results suggest that individuals with recurrent major depression shift to permanent disability benefits after the end of the eligibility periods to temporary disability benefits and unemployment benefits.

We find a significant decline in annual earnings by 51%. This decline is consistent with fewer days worked annually due to the important increase in long absences and unemployment spells and due to the transition to disability benefit reciprocity.

After the transitional period of four years, the employment rates and earnings remain persistently lower for individuals with recurrent major depression than for individuals in the control group.

The estimated event-study coefficients also show the trend differences between the two groups in the *pre inclusion period* (years  $-8$  to  $-2$ ) (Fig. 2). They indicate similar trends between the two groups between years  $-8$  and  $-2$ . However, according to the estimated coefficients for years  $-8$  to  $-6$ , individuals with recurrent major depression have experienced unemployment more often than do those in the control group. This result thus indicates past experiences of unemployment, which are past adverse events that may have caused recurrent major depression later in life.

### 3.3. Effects by gender

There are few noticeable differences in effect sizes between men and women. The findings show large and persistent effects on employment and annual earnings as well as a large shift to disability benefit reciprocity after four years for both men and women (Fig. 3). We notice only a difference: the effect of recurrent major depression on the unemployment benefit reciprocity rate is greater for men than for women in years 2 and 3, without leading to significant differences in terms of impact on employment rates.

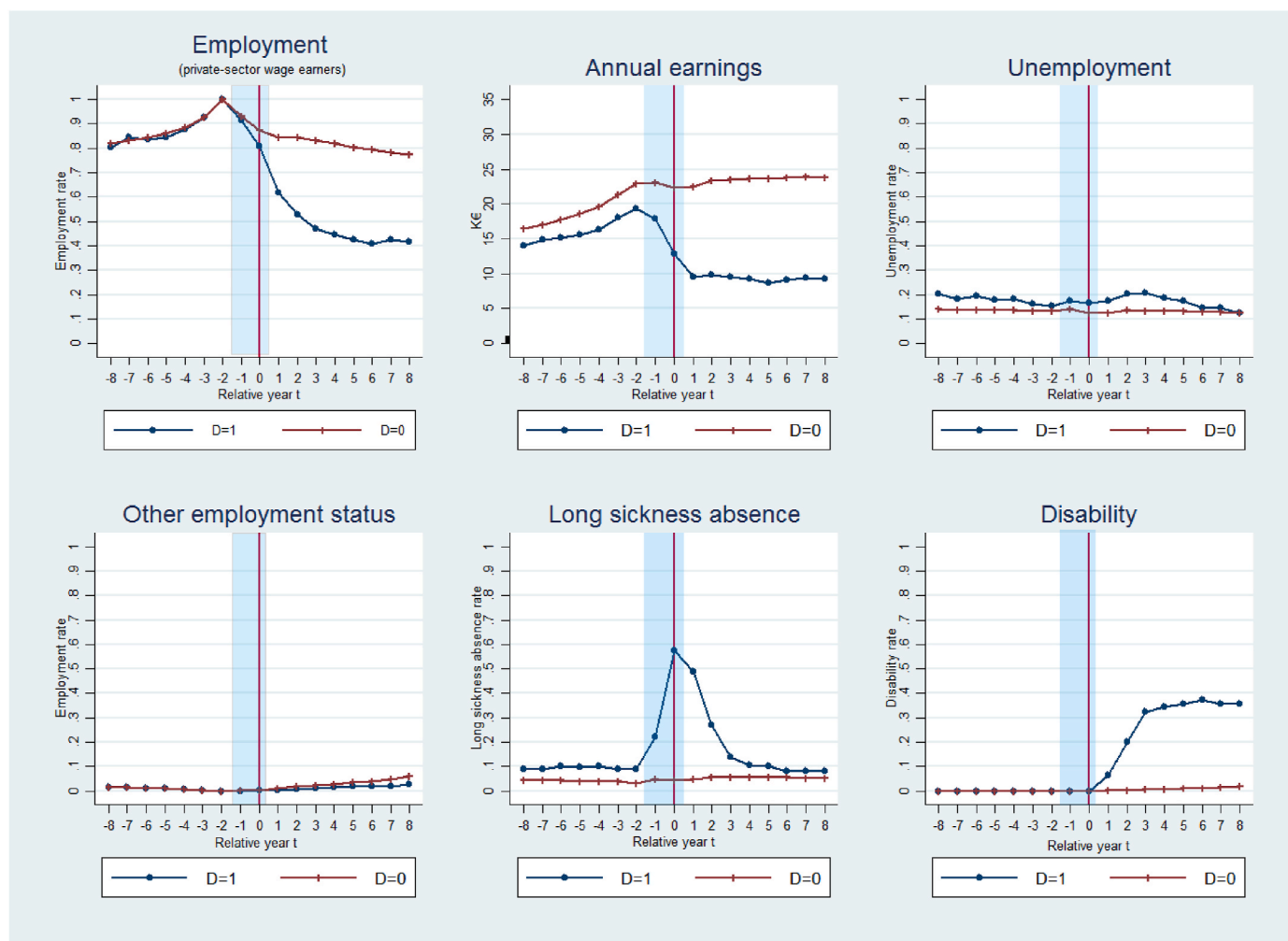


Fig. 1. Descriptive trends

**Notes:** This figure displays the trends in individuals' labor market outcomes between years  $t = -8$  and  $t = 8$  for the two groups: (D = 1) is the group of individuals employed in the year  $t = -2$  who enter the LTI scheme at year  $t = 0$  with a diagnosis of recurrent major depression; (D = 0) is the control group of individuals employed in the year  $t = -2$  who do not enter the LTI scheme. The shaded area represents the *inclusion period* ( $t = -1$  and 0). The definition of labor market outcomes is presented in [Subsection 2.3](#).

### 3.4. Effects by age group

The estimated effects by age group are presented in [Fig. 4](#).

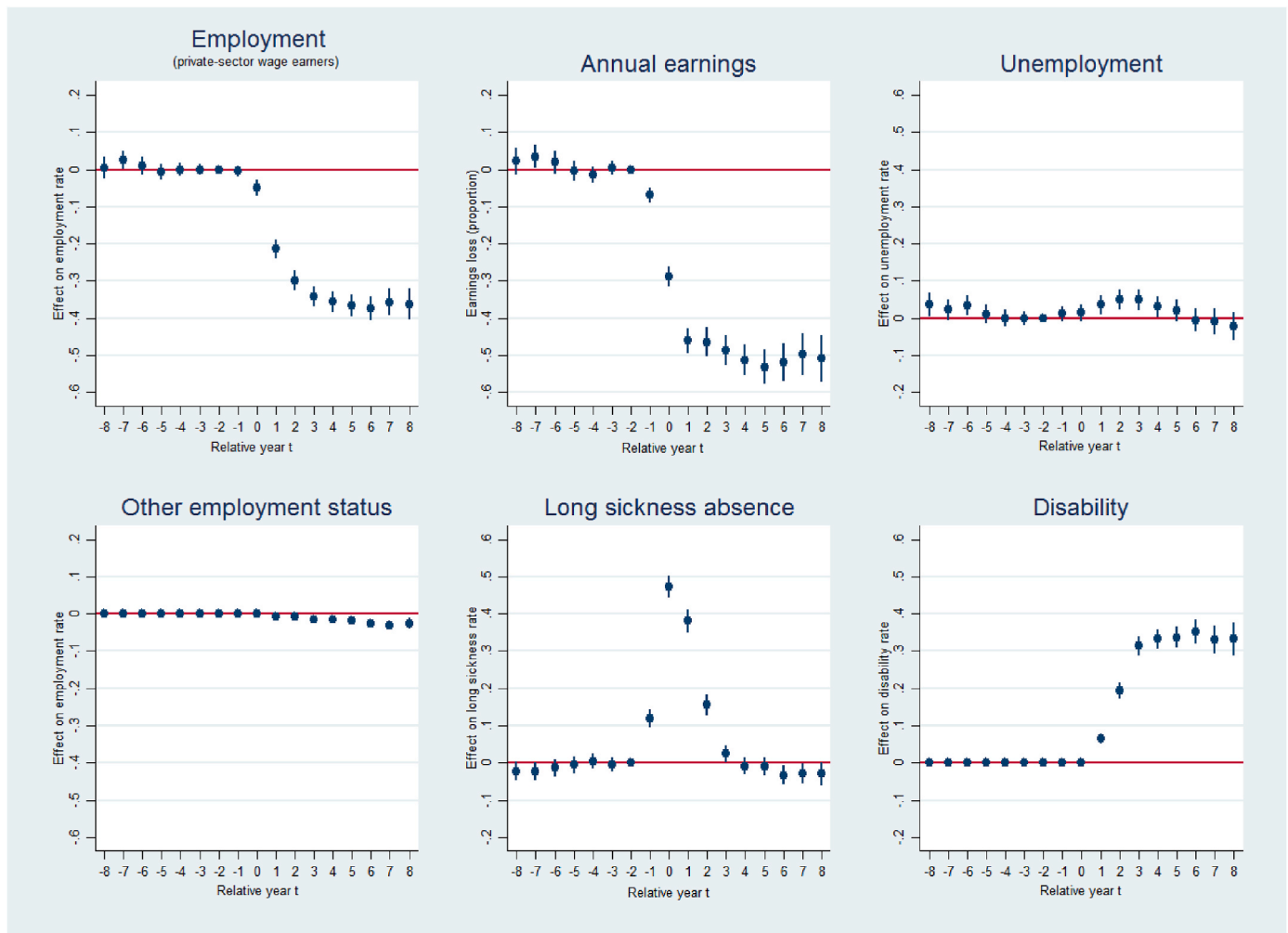
**Ages 25–34.** For young employees aged 25–34 years in year 0, the effects of recurrent major depression on employment rates are important (but lower than the effects found for older employees). Recurrent major depression implies a decrease in employment rates of approximately 20 percentage points compared with the control group. For these young individuals, recurrent major depression not only significantly increases long absences but also unemployment rates of up to 10 percentage points in year 3. Recurrent major depression increases the probability of shifting to disability benefit reciprocity by 15 percentage points in year 3 and by 20 percentage points in year 8. We find that recurrent major depression implies a earnings decline of more than 40% for this age group.

**Ages 35–44.** For middle-aged individuals, recurrent major depression decreases employment rates by 31 percentage points in year 4 and 38 percentage points in year 8. Middle-aged individuals shift to disability benefit reciprocity but to a lesser extent than older individuals do; recurrent major depression increases disability benefit reciprocity rates by 25 percentage points in year 4 and by 27 percentage points in year 8. The transitional period is marked by not only increased long

absences but also increased unemployment benefit reciprocity rates. Specifically, recurrent major depression increases unemployment benefit reciprocity rates by up to 8 percentage points in year 3. We find a decline in annual earnings of approximately 50%.

**Ages 45–60.** For older individuals aged 45–60 years, recurrent major depression implies an increase in long absences during the transitional period and a progressive shift to disability benefit reciprocity. However, it does not increase the unemployment benefit reciprocity rate. Individuals with recurrent major depression experience a very large decrease in their employment rates (–48 percentage points at year 6). They also experience large persistent earnings losses (–55%). A large share of these individuals are enrolled in disability benefits (+42 percentage points at year 4 and +49 percentage points at year 8).

Furthermore, for this age group, we find that, in years 6–8, recurrent major depression reduces the rates of long absences and unemployment benefit reciprocity. These benefits are provided to individuals who have accumulated work hours and earnings in the previous years. Thus, this result suggests that, over the long term, individuals with recurrent major depression likely experience a strong decrease in their labor attachment, which implies that they become ineligible for these income benefits after a few years.



**Fig. 2.** Effects of recurrent major depression on labor market outcomes

**Notes:** This figure shows the estimated effects of recurrent major depression of individuals' labor market outcomes. Specifically, it reports the estimated coefficients of the event-study regressions weighted by CEM weights with 95% confidence intervals. The relative year  $t$  corresponds to the year relative to the year of entry in the LTI scheme for recurrent major depression.

The definition of labor market outcomes are presented in [Subsection 2.3](#).

### 3.5. Reverse causation and omitted confounders

A concern is that our estimates might overstate the effects of recurrent major depression on individuals' labor market outcomes, because of a reverse causation effect. A negative shock to employment before the entry in the LTI scheme may contribute to the onset or recurrence of major depression, which can increase the probability of entry into the LTI scheme. Furthermore, to decide to claim the inclusion in the LTI scheme, the referring physician might consider the employment status of the patient. A job loss may induce the loss of employer-provided supplemental health insurance. The LTI scheme would compensate for the loss of health insurance and provide supplemental health insurance covering healthcare related to the disease. The referring physician may thus be more prone to claim the inclusion in the LTI scheme for a patient who cannot afford payments because of job loss and the loss of employer-provided health insurance.

The estimates might also overstate the effects due to the presence of confounding factors. The etiology of major depression is believed to be multifactorial, resulting from biological, genetic and environmental factors, personal vulnerabilities and stressful life events experienced at a young age or in adulthood (Otte et al., 2016; Marx et al., 2023). Recurrent major depression may be caused by unobserved factors, such as for example a lack of social support networks or the personality traits

of individuals. These unobserved factors may influence labor market outcome trends, which may lead to biased estimates.

Comorbidities might be important confounders. People with major depression are significantly more affected by comorbidities than are people without major depression (Farmer et al., 2008). Comorbidities may simultaneously be correlated with the risk of depression recurrence and worsened labor market outcomes. In our study, these confounding effects might be limited since we restrict the groups of interest to individuals without diagnosed LTIs and without permanent disability benefits between years  $-4$  and  $0$ . However, this restriction does not fully exclude the possibility that other comorbid conditions (such as chronic pain or anxiety disorders), not considered as LTIs, are correlated with both the probability of entry into the LTI scheme for recurrent major depression and labor market outcomes. These comorbidities might lead to overstate the effects of recurrent major depression on labor market outcomes.

To explore these issues, we assess the presence of a bias due to a reverse causal effect or due to omitted confounders. To do so, we examine whether the employment status in year  $-1$  is correlated with the probability of entry into the LTI scheme in year  $0$ . A negative correlation would suggest that job loss causes entry into the LTI scheme or that confounding factors simultaneously cause job loss and entry into the LTI scheme.

**Table 2**  
Effects of recurrent major depression on labor market outcomes

	Relative year t									
	-1	0	1	2	3	4	5	6	7	8
<b>Employment</b>	-0.004 (0.007)	-0.049*** (0.010)	-0.213*** (0.013)	-0.299*** (0.013)	-0.342*** (0.014)	-0.356*** (0.014)	-0.366*** (0.015)	-0.373*** (0.016)	-0.357*** (0.018)	-0.361*** (0.020)
<b>Other employment status</b>	-	-	-0.006*** (0.001)	-0.007*** (0.002)	-0.016*** (0.002)	-0.016*** (0.003)	-0.017*** (0.004)	-0.025*** (0.004)	-0.030*** (0.006)	-0.025*** (0.007)
<b>Long sickness absence</b>	0.118*** (0.012)	0.473*** (0.015)	0.388*** (0.015)	0.155*** (0.014)	0.023*** (0.012)	-0.008 (0.011)	-0.009 (0.012)	-0.033*** (0.012)	-0.029* (0.014)	-0.029* (0.015)
<b>Unemployment</b>	0.011 (0.010)	0.015 (0.011)	0.035*** (0.013)	0.050*** (0.014)	0.049*** (0.014)	0.030** (0.014)	0.020 (0.014)	-0.004 (0.016)	-0.008 (0.017)	-0.022 (0.019)
<b>Disability</b>	-	-	0.064*** (0.006)	0.193*** (0.010)	0.314*** (0.012)	0.332*** (0.013)	0.337*** (0.014)	0.352*** (0.016)	0.330*** (0.019)	0.332*** (0.022)
<b>Annual earnings (% loss)</b>	-6.9*** (1.0)	-28.9*** (1.3)	-46.0*** (1.6)	-46.4*** (1.9)	-48.6*** (2.0)	-51.2*** (2.1)	-53.0*** (2.3)	-51.8*** (2.5)	-49.7*** (2.8)	-50.9*** (3.2)
Number of observations										
D = 1	1,430	1,430	1,415	1,363	1,310	1,264	1,045	812	622	455
D = 0	156,954	156,954	154,791	152,01	148,816	145,478	123,593	99,883	78,875	58,797

**Notes:** This table displays the estimated effects of recurrent major depression on individuals' labor market outcomes. Specifically, it reports the coefficients indexed from t = -1 to t = 8 from the event-study regressions weighted with CEM weights. The table shows: the estimated effects during the *inclusion period* (years t = -1 and t = 0) and the estimated effects during the *post inclusion period* (from t = 1 to t = 8).

Note that the other estimated coefficients, for the years t = -8 to t = -2, are not reported in this table, and are reported in Fig. 2.

The definition of labor market outcomes is presented in Subsection 2.3.

Robust standard errors (in brackets) are clustered at the individual level.

Significance level: \*\*\*: p < 0.01; \*\*: p < 0.05; \*: p < 0.1.

The findings indicate a nonsignificant relationship between employment status in year -1 and entry in the LTI scheme in year 0. The estimated coefficient is close to zero and nonsignificant (Table 2). We also find nonsignificant correlations for the subsets of men and women (Fig. 3) and for each age group (Fig. 4). In addition, we find a nonsignificant correlation between unemployment benefit reciprocity in year -1 and entry into the LTI scheme in year 0. Overall, these results suggest that the biases due to reverse causation or to omitted confounders are probably limited in our research design.

Furthermore, the potential confounding effects of time-invariant individual characteristics on the labor market outcome are captured by the individual fixed effects term in the regression. The identification of effects relies on the parallel trends assumption. As previously mentioned, the results indicate parallel trends between the two groups before the year of entry in the LTI scheme, which suggests that the parallel trends assumption may be valid.

In addition, we estimate alternative specifications that control for the employment shocks experienced by individuals during and before the year of entry in the LTI scheme. We also test the use of propensity score matching versus CEM. To control for the fluctuations of local economic conditions, we add year dummies interacted with local area dummies in the regression. These estimations are presented in the online appendix 'Robustness analysis'. Overall, the results show the robustness of our estimates to these specification changes.

## 4. Discussion

### 4.1. Findings and contributions to the literature

The literature has studied the relationship between health and employment using panel data and has highlighted negative effects of poor health on employment in different institutional contexts (e.g., Charles, 2003; Böckerman and Ilmakunnas, 2009; García-Gómez, 2011; García-Gómez et al., 2013; Trevisan and Zantomio, 2016; Jeon, 2017; Hullege and Konig, 2018; Bubonya et al., 2019; Simonetti et al., 2022). Our study contributes to this literature and, more specifically, to the analysis of mechanisms involved in the relationships between severe depression and employment. We examine the hypothesis that recurrent major depression has large negative consequences on individuals' employment and earnings. Few studies have explored this issue.

Previous findings suggest that the recurrence of major depression may explain an important part of the effects of major depression occurring before adulthood and in early adulthood on employment and earnings later in life (Hakulinen et al., 2019a; Wang et al., 2023). In our study, we focus on individuals initially attached to the labor market and aged between 20 and 60 years, and we examine the extent to which they are affected by recurrent major depression during their working life.

We estimate that recurrent major depression implies a decrease in employment rates of 35 percentage points and a loss of annual earnings by 51%. These effects are larger than those reported in previous studies estimating the effects of depression or of other health conditions on employment and income. Our results are consistent with the hypothesis that the recurrence of major depression has large adverse effects. They suggest that the recurrence of this illness must be considered in analyses of the consequences of depressive disorders.

The literature indicates similar effect sizes of depressive disorders on employment for men and women with slightly weaker effects for women (Bubonya et al., 2019). We find that recurrent major depression has similar effects for men and women.

We find marked differences between age groups. For older individuals aged between 45 and 60 years, the results show a massive shift to disability benefits and large earnings losses. These large effects may indicate that, compared with younger individuals, older individuals' work capacities are strongly affected by recurrent major depression. However, these large effects may be partly due to a behavioral response. One may suggest that older employees may be more prone to claim disability benefits since, in the French institutional setting in the period studied here, disability benefit reciprocity gives them the right to retire early (from 60 years) at a full retirement pension rate. This might explain why we observe a large shift to disability benefits before the age of 60 years, particularly in a policy context where the legal retirement age is increasing. We emphasize that individuals older than 60 years are not represented in the scope of our analysis. It must also be noted that, therefore, our estimates do not encompass the impacts at these ages on employment, earnings and retirement. This issue should be studied in future work by mobilizing detailed data on these outcomes for older individuals.

For middle-aged and young individuals, the effects of recurrent major depression on employment rates are important but smaller than those estimated for older individuals. The transition rates to disability



**Fig. 3.** Effects of recurrent major depression on labor market outcomes by gender

**Notes:** This figure shows the estimated effects of recurrent major depression of individuals' labor market outcomes for men and women. Specifically, it reports the estimated coefficients of the event-study regressions weighted by CEM weights with 95% confidence intervals. The relative year  $t$  corresponds to the year relative to the year of entry in the LTI scheme for recurrent major depression. The definition of labor market outcomes are presented in *Subsection 2.3*.

benefits are also more moderate. The results suggest a strong negative and persistent effect of recurrent major depression on annual earnings. We find both a sharp increase in long work absences and a sizeable increase in unemployment benefit reciprocity. Many of these individuals remain in the labor market but are unemployed.

A study that draws on U.S. survey data suggests that severe depression in early adulthood (including individuals aged 27–35 years in 1992) implies a decrease by 10 percentage points in the probability of employment at age 50 (Wang et al., 2023). In our study, for young individuals (aged 25–34 years), we find larger effects of recurrent major depression on employment rates (–20 percentage points) that develop over the eight years after the diagnosis. This is consistent with the hypothesis that our estimates reflect the effects of more disabling depressive disorders due to the recurrence of the illness.

Our results also show the effects of recurrent major depression on the transitions to social insurance benefits. During the first years, the disease increases the likelihood of receiving temporary disability benefits and unemployment benefits. The replacement rates of these temporary benefits are higher than the replacement rates of permanent disability benefits. SHI temporary disability benefits represent 50% of the previous earnings of employees during a maximum duration of three years and are often increased by supplemental insurance benefits provided by employers. Unemployment benefits amount to 70% of previous wage

earnings, on average. The replacement rates of SHI permanent disability benefits might be lower; they represent up to 50% of previous wage earnings and may be increased by supplemental disability insurance benefits. Furthermore, the eligibility rules to permanent disability benefits are stringent; they require notably a degree of work incapacity of at least two-thirds, as assessed by an SHI physician. Therefore, one may expect that individuals are incentivized to claim temporary disability benefits and unemployment benefits, as long as possible, until expiration of the eligibility to these temporary benefits, before claiming permanent disability benefits. Consistent with this expectation, our results show a long transitional period of four years before the transition to permanent disability benefits.

One strength of this study is that it relies on the identification of recurrent major depressive disorders on the basis of a clinical diagnosis. The referring physician of the patient establishes the diagnosis by relying on all the information collected on the health and healthcare trajectories of the patient. In contrast to previous studies, the identification of patients with mental disorders is not confined to patients hospitalized for acute psychiatric events. In our study design, the patient can be identified in primary or other community care, not only through hospital admissions. The referring physician (often a general practitioner) is the main care coordinator and interacts with psychiatrists and other health professionals.



**Fig. 4.** Effects of recurrent major depression on labor market outcomes by age

**Notes:** This figure shows the estimated effects of recurrent major depression of individuals' labor market outcomes by age group. Specifically, it reports the estimated coefficients of the event-study regressions weighted by CEM weights with 95% confidence intervals. The relative year  $t$  corresponds to the year relative to the year of entry in the LTI scheme for recurrent major depression.

The definition of labor market outcomes is presented in [Subsection 2.3](#).

One limitation is that some individuals experiencing recurrent major depression may not seek medical treatment, remain undiagnosed, and thus may not be included in the LTI scheme. Furthermore, some patients, even if they fulfill the medical criteria, might be unwilling to enter the LTI scheme for fear of being stigmatized. All these cases, not recorded in the LTI scheme, are thus included in the control group. These classification errors could cause the effects of recurrent major depression on individuals' labor market outcomes to be understated. It is also possible that individuals with less severe cases of recurrent major depressive disorders, while fulfilling the medical criteria, are less likely to be included in the treatment group. If so, it could lead to include more severe cases in the treatment group and to inflate the effects of recurrent major depression.

Another issue is that our estimates might overstate the true effects due to the presence of unobserved confounders. Confounders might be other illnesses that both increase the risk of recurrent major depression and have negative effects on labor market outcomes. To limit this concern, we have restricted the sample to individuals without other diagnosed LTIs and without disability benefit reciprocity before or concomitant with inclusion in the LTI scheme for recurrent major depression. Nevertheless, this restriction does not preclude confounding effects of other comorbidities not considered as LTIs. Furthermore, our estimates might overestimate the effects due to a reverse causality effect.

We do not find significant correlations between the employment outcomes one year before the entry in the LTI scheme and the probability of entry in the LTI scheme for recurrent major depression. Furthermore, we have estimated alternative specifications that control for employment shocks before and concomitant to the entry in the LTI scheme and that control for fluctuations in aggregate economic conditions. The point estimates are robust to these specification changes. Overall, the results suggest that the potential biases due to reverse causation or to omitted confounders should be limited.

We emphasize that our study focuses on individuals who had at least three identified recurrences of major depression. The data do not provide information on the precise number of recurrences or the severity of symptoms. Therefore, we cannot study either the effects of less severe recurrent depression or the effects of the number of recurrences.

People with mental illnesses, identified either through register data or survey data, may receive mental health treatment and benefits related to their mental health disorders. In our study, as previously mentioned ([Subsection 2.2](#)), individuals with recurrent major depression are included in a medical protocol and they benefit from extended insurance coverage. The estimated effects may thus be influenced by the medical treatment and the extended benefits. Specifically, a possibility is that the medical treatment combined with extended healthcare insurance coverage might lead to improved employment by reducing the

recurrence or severity of the disease. It could thus attenuate the negative effects of the disease on employment. However, one may expect a negative effect of the extended maximum duration of temporary disability benefits on subsequent labor outcomes, because this extension might increase absences from work, which in turn could worsen individuals' employment prospects. Investigating these effects would be an important avenue for future work.

The scope of this study is representative of private-sector employees (representing approximately 70% of workers). It does not encompass either public-sector employees or self-employed individuals. However, the importance of the effects that we find suggests that recurrent major depression might also have large consequences for individuals' careers in these employment sectors. Studying these effects on these specific workers would be important for formulating tailored policies for these populations.

A question is to know whether our results can provide insights not only for France but also for other countries. The effect sizes may be different for countries having different institutional settings. The literature has compared the effects of health shocks on individuals' employment and disability benefit reciprocity across European countries (García-Gómez, 2011). It suggests important heterogeneity in effects between countries, with France being among the countries with the smallest effects.

The French welfare system is globally considered protective but less generous than the welfare systems in Northern Europe. In this context, one may expect that the incentives to work are higher in France, by comparison to these countries. Furthermore, the index of integration policies for disabled people for France appears close to the average index (Böheim and Leoni, 2018). Integration policies may help people with disabilities remain in employment. However, we must stress that, in France, like in other countries, the permanent disability benefit program may generate disincentives to work and may lock people in disability benefits. Furthermore, the French labor market is dual with, on the one side, a majority of workers in permanent employment having a strong employment protection and, on the other side, temporary workers, having low employment protection, and unemployed individuals. If people with poor health conditions lose their employment, they may have little opportunities to return to permanent employment and are more likely to alternate between temporary jobs, unemployment and inactivity.

The healthcare system in France offers high-quality health services, but people with severe mental illnesses suffer from difficulties of access to healthcare facilities. In our study, as previously mentioned, individuals with recurrent major depression are included in a medical protocol and they benefit from an extended coverage of the healthcare expenditures related to their illness. Therefore, we may assume that these individuals have access to healthcare. This healthcare access may have a positive effect on their health and mitigate the negative effects of depression on their employment and earnings.

Given these considerations, and given the empirical findings from the literature (García-Gómez, 2011), we suggest that recurrent major depression might also have large negative effects on the employment of individuals in other institutional contexts, and that our estimates for France may provide a lower bound. One avenue for future research would be to compare the effects of recurrent major depression on employment and income by using large-scale register data, comparable across countries, in order to better understand the influences of welfare systems, labor policies and healthcare systems.

#### 4.2. Policy implications

Our estimations indicate that recurrent major depression has strong negative impacts on individuals' labor market outcomes. These effects may be reduced by improving mental health recovery; for instance, preventing the disease recurrence (Biesheuvel-Leliefeld et al., 2015) may contribute to reduce these effects. Furthermore, providing

employment support can increase employment participation (Drake et al., 2021). Implementing these interventions early would be relevant. In the French healthcare system, employment support could be provided at the entry of patients in the LTI scheme, which would prevent and reduce subsequent adverse effects of the disease on employment and earnings in a timely and efficient manner.

These interventions can also be efficient in preventing the feedback effect that can occur due to the reverse negative effects of persistent nonemployment, unemployment and low earnings, on mental health. The negative effects of worsened employment on mental health are documented in the literature (e.g., Otte et al., 2016; Cygan-Rehm et al., 2017; Caniglia, 2024).

Furthermore, differentiated health and labor policies tailored to age groups might be efficient. Our results suggest that a significant share of young and middle-aged employees with recurrent major depression remain in the labor market but are unemployed. Specific employment support could be established for each age group early through the healthcare system (for instance, in France, at entry into the LTI scheme). It could also be established during long work absences, during unemployment spells, and during permanent disability benefit reciprocity. These interventions would enhance occupational mobility and employment retention, and they could help individuals obtain jobs that align with their vocational aspirations.

#### CRedit authorship contribution statement

**Quentin Cau:** Formal analysis, Data curation. **Coralie Gandré:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Conceptualization. **Pascale Lengagne:** Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

#### Ethics statement

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.socscimed.2025.118056>.

#### Data availability

Data are available on request.

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