Health Shocks and Labour Market Transitions in Europe*

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Abstract

This paper investigates the relationship between an adverse health shock, measured by the limitation in preforming daily activities, and labour market transitions in twenty-six European countries. The European Union Statistics on Income and Living Conditions dataset is used (2007-2009). Matching techniques are implemented in order to control for the non-experimental nature of the data. The empirical analysis reveals a significant causal effect of the health shock on the likelihood of leaving full-time employment. Individuals who incur an adverse health shock are significantly more likely to transit either into part-time, unemployment or inactive status. The estimated effect, using the pooled sample, is negative. Nevertheless, the results differ across countries depending on the country-specific social security system. The largest negative effect is found in Romania, Cyprus and Bulgaria, ranging from 31% to 23%, respectively. It is close to zero in Slovakia and Latvia. I argue that these discrepancies are explained through the heterogeneity in social security systems across Europe. Individuals living in countries characterised by higher work incentives, within the integration disability policy, are less likely to drop out from full-time employment after the health shock occurs.

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1 Introduction

It is essential to social inclusion and integration that people with health problems (or disability) find a job, but their occupation opportunities are nevertheless restricted. Dramatic differences in labour market outcomes are observed on the basis of disability (Acemoglu and Angrist, 2001 for US and Jones et al., 2006 for the UK case). On average, across OECD countries, the employment rate for this fraction of the population is just above 40%, slightly over a half compared to the employment rate for people without disability which is around 75% in the mid-2000s.

In 2010, OECD reports that a higher employment rate for people with disability is not systematically associated with specific employment support programs (Sickness, Disability and Work - OECD report, 2010). Nevertheless, most developed countries try to implement a range of relevant disability policies. On the one hand, they attempt to assure that individuals who are (or become) disabled do not suffer from any economic adversity, avoiding possible income losses. On the other hand, they tackle social and labour market exclusions in order to stimulate the participation of people suffering from disability in the labour market.[1]

A large amount of contributions, in the economic literature, has focused its attention on the impact of health status on socioeconomic conditions and labour market outcomes, mainly employment and earnings dynamics. While there is a general agreement about the strength of this relationship, research - focusing on the mechanism behind it - has produced different results due to the complexity of the issues involved.[2] The existing empirical evidence acknowledges the relationship between health problems and labour market outcomes, frequently focusing on elderly job behaviours and their retirement pathways, analysing both the static and dynamic effects.[3] The num-

[1]Most industrialized countries recognize the need for effective policies for the disabled - the American with Disability Act (ADA) for the U.S.A., the Disability Discrimination Act (DDA) for the UK, the Severely Disabled Person Act (SDPA) for Germany - which support workers whose prospects of either remaining or re-entering employment are jeopardized by work injury, long-term illness or disability (Lechner and Vazquez-Alvarez, 2011).

[2]From a theoretical point of view, the expected relationship between the health status and labour market outcomes can be illustrated using the health production model by Grossman (1972). The model makes predictions over the effects of changes in prices of health care and other goods, labour market outcomes such as employment and wages, and technological changes. Each individual is both a producer and a consumer of health which is treated as a stock (it deteriorates over time in the absence of "investments" in health, so that health is viewed as a sort of capital). The implication of the models is that health is both a consumption good that yields direct satisfaction and utility, and an investment good, which yields satisfaction to consumers indirectly through increased productivity, fewer sick days, and higher wages. Investment in health is costly as consumers must trade-off time and resources devoted to health. Thus, these factors are used to determine the optimal level of health that an individual will demand. In this paper, I found that individuals who incur an adverse health shock are significantly more likely to leave full-time employment.

[3]See some examples on both static and dynamic effects: Berkovec and Stern, 1991; Bound et al.,

ber of studies, which looks at the interaction between health conditions and labour market transitions for younger individuals, is less extensive, partly due to the difficulty of obtaining informative datasets (Lindeboom et al., 2006).

Poor health reduces the individual's productivity in work and in earnings. These adverse effects will differ depending on both the peculiarity of the occupation (Morefield et al., 2011) and the severity of the disability (Jimenez-Martin et al., 2006; Oguzoglu, 2011). Morefield et al. (2011), using U.S. longitudinal data, analyse a job history of both blue and white-collar employees and their transitions from good to bad health statuses. Their findings suggest that blue-collar workers' health faster deteriorates than their white-collar counterparts. This result is due to the fact that the formers are more likely to experience a negative health shock on the job market. Jimenez-Martin et al. (2006) find that, for Spanish workers aged between 50 and 64, the probability of continuing working decreases with the severity of the shock. Furthermore, in Oguzoglu's study (2011), the effect of work limitation on labour market participation is explored by considering different health shocks, which are heterogeneous with respect to their severity. It is, indeed, recognised that the adverse effect of a health shock on labour participation persists beyond its duration, with the persistence depending on individual characteristics, the severity of the shock and social security provisions.[4]

There are at least two ways in which a health shock may influence labour market trajectories. On the one side, health shocks are likely to cause longer unemployment spells when an individual is out of labour market (Boheim and Taylor, 2000; Stewart, 2001; Gannon and Nolan, 2007).[5] On the other side, health shocks are more likely to move workers from the employment stock to unemployment, retirement or inactivity, which is to say looking at transitions (Garcia-Gomez et al., 2010).[6]

This study contributes to this branch of research by quantifying the effects of an adverse health shock on the individual labour market outcomes across Europe. Match-

1999; Currie and Madrian, 1999; Riphahn, 1999; Smith, 2004; Au et al., 2005; Disney et al., 2006; Hagan et al., 2008; Nigel et al., 2006 and Zucchelli et al., 2007.

[4]Additionally, an increasing quantity of literature examines the influence of measurement error, justification bias and the endogeneity problems that further complicate the analysis (Bound, 1991).

[5]For the Spanish population Garcia-Gomez and Lopez-Nicolas (2006) analyse the effects of a health shock on the probability of leaving employment and transiting out to unemployment or inactivity. Thus previous literature confirms the existence of an effect of health events on labour market outcomes. However, there is a lack of consensus on their magnitude. The paper proposed by Jenkins and Rigg (2004) explain the complexity of the mechanisms through which a health shock affects labour market outcomes. The authors use the BHPS to split the effect of disability into three steps (selection effect - the effect of disability onset - the effect of disability post onset). They point out that people who had experienced the onset of disability were typically characterized by having lower qualifications, income and employment rates. After the initial onset effect, average work earnings rise, but the probability of being unemployed increases in line with the duration of the disability.

[6]The authors show that health is a key determinant for employment transitions, and the effects are higher for men than for women.

ing techniques are used to control for the non-experimental nature of the data. The question I want to empirically address is: what is the effect of a health shock on labour market transitions across Europe? I further provide some insight about the real effectiveness of disability policies in twenty-six European countries from 2007 and 2009, using the European Union Statistics on Income and Living Conditions dataset (EU-SILC). Three are the contributions with respect to the existing literature.

Firstly, it deepens the understanding of the relationship between health status and labour market dynamics, using a comparative empirical analysis among twenty-six European countries. To the best of my knowledge, the only contribution on these terms was made by Garcia-Gomez (2011) with a smaller sample of nine European countries.

Secondly, differently from the previous literature and in particular to Garcia-Gomez (2011), a peculiar measure of a health shock is used. While Garcia-Gomez (2011) uses "chronic illness" as a measure of health shock, I prefer to focus on "limitation in activities due to health problem" which is a more specific measure of disability. In fact, this variable properly captures the presence of long-standing limitations, impairment and disabilities, which are more likely to cause an adverse effect on labour market outcomes. In this way, I can rule out cases - such as anemia, asthma, celiac disease, diabetes and headache - that are considered as chronic illnesses but do not strongly influence individuals' work activities. This analysis proposes different conclusions respect to Garcia-Gomez (2011) papers and it appears more accurate in terms of health shock effects on labour market transitions. The variable used in this paper considers any form of disability, handicap and impairment, which causes severe difficulties for the individual in performing usual daily activities. The purpose of using this measure is to isolate the presence of severe limitations, ruling out cases in which individuals are affected by chronic illnesses, which do not substantially limit their usual work activity.

Finally, I provide evidence on how heterogeneous effects of health shocks on labour market outcomes depend on country-specific social security arrangements. In other words, individuals living in countries characterised by higher work incentives are less likely to drop out from full-time employment after a health shock occurs.

The results of this analysis show that individuals who incur in a health shock are significantly more likely to leave their full-time employment. I find a stronger negative causal effect from a health shock on the probability of full-time work than Garcia-Gomez (2011). Furthermore, I demonstrate that the countries with higher level of work incentives exhibit smaller effect in terms of drop out of full-time job. It is therefore of great interest to empirically investigate this type of comparative analysis in view of the standardisation of EU policies.

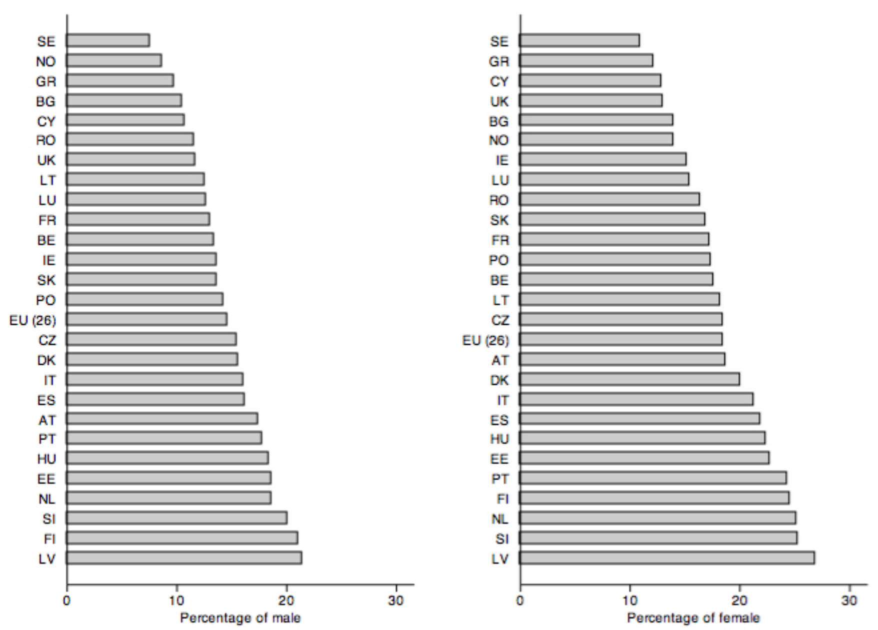
Section 2 provides a brief overview of social protection policies and health status across Europe. EU-SILC data and the descriptive statistics are presented in section 3. Estimations and main results are in section 4. The section 5 focuses on the relationship between the probability of leaving full-time employment and the integration policy indicator. Section 6 contains some conclusions.

2 Health and disability policy: some stylised facts

This section provides a general picture of health status and social protection expenditure across Europe in order to give some insights about the existing link between institutions, health shocks and labour market outcomes.[7]

Using data from the EU-SILC survey, I present the overall health statuses across Europe in 2009. Figures 1 and 2 show, grouped by gender, the percentage of people who suffered from *some* and *severe* limitation in daily activities during 2009, respectively.[8] The highest percentage of individuals who suffer from both *some* and *severe* limitations in daily activities are generally found for females. This gender gap is stronger when *some* limitation case is considered. Across Europe, Sweden and Norway (Latvia) show one of the smallest (largest) fractions of individuals - both males and females - who suffer from *some* limitation in daily activities. For the *severe* limitation case, Bulgaria (the United Kingdom) registers only 5% (almost 10%) of females and males who experience this kind of adverse health shocks.

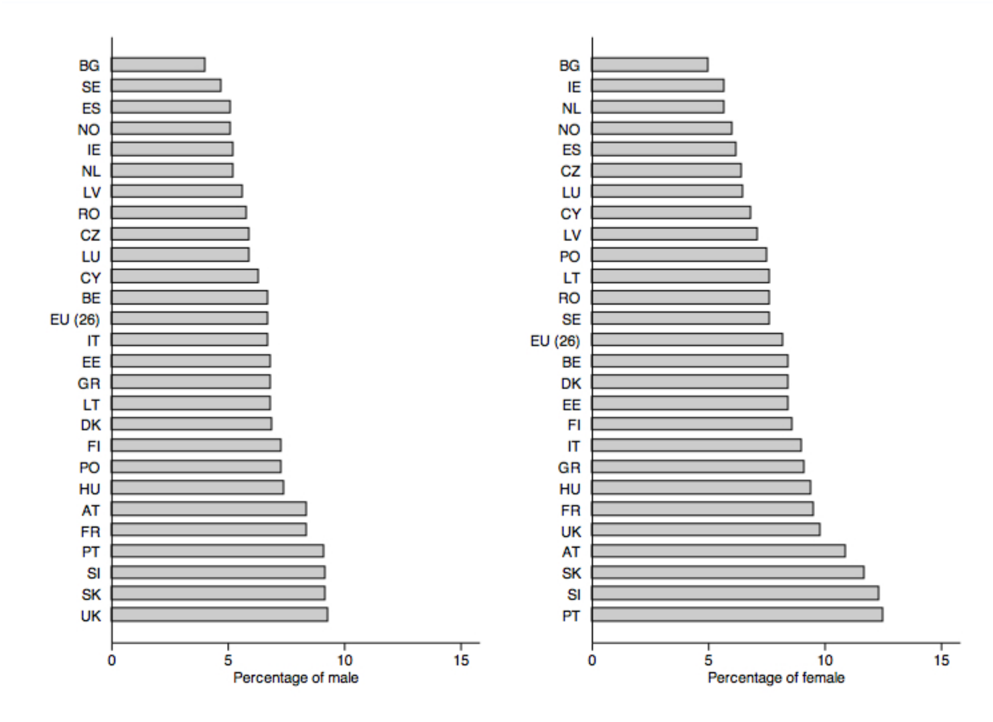
Figure 1: Percentage of some limitations across Europe (2009)



[7]Countries included are: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Denmark (DK), Estonia (EE), Spain (ES), Finland (FI), France (FR), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Lithuania (LT), Luxembourg (LU), Latvia (LV), Netherlands (NL), Norway (NO), Poland (PO), Portugal (PT), Romania (RO), Sweden (SE), Slovenia (SL), Slovakia (SV), United Kingdom (UK).

[8]This is the measure I will use in Section 4.

Figure 2: Percentage of severe limitations across Europe (2009)



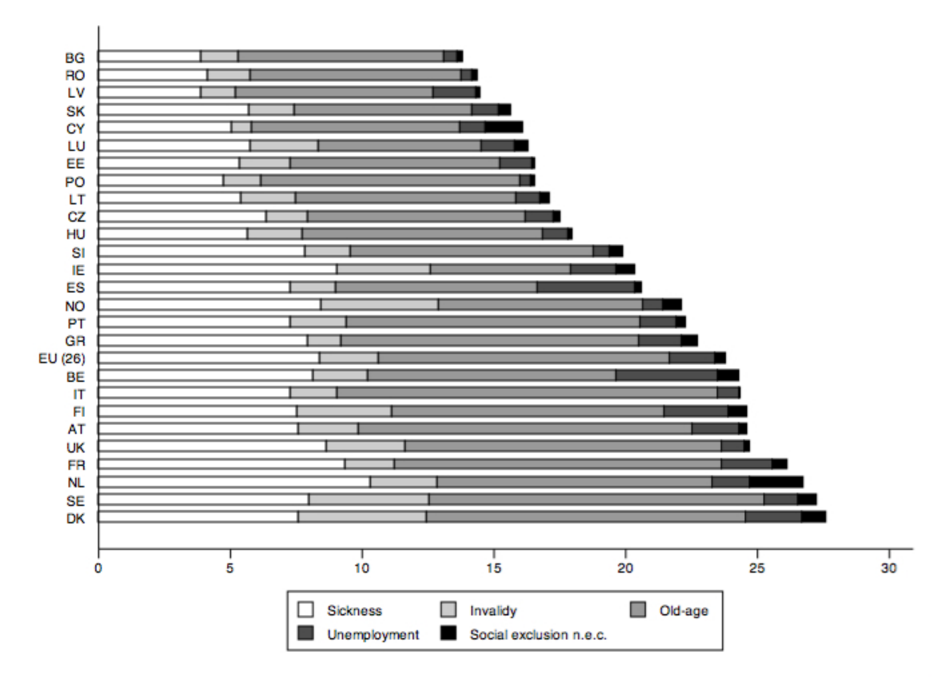
The just described phenomenon has different implications in terms of expenditure in social protection. The European system of integrated social protection statistics defines social protection as all interventions from public or private bodies intended to relieve individuals of the burden of a defined set of risks or needs, provided that there is neither a simultaneous reciprocal nor an individual arrangement involved.[9] The list of risks or needs that may give rise to social protection is fixed by convention as follows: sickness-health care, invalidity (or disability), old-age, survivors, family and children, unemployment, housing and social exclusion not elsewhere classified.[10]

Figure 3 provides an illustration of the differences in social expenditure between the twenty-six countries under investigation. The social protection benefit (measured as a percentage of GDP) is split into the five aforementioned categories. Romania and Bulgaria register the lowest fraction of GDP dedicated to social protection benefits while Denmark and Sweden register the highest. In particular, Nordic countries invest almost 15% of their GDP in sickness, while Romania and Bulgaria spend only 5%. Latvia shows the lowest fraction of its GDP in both sickness and disability benefits (only Cyprus spends less). Ireland holds the lead for old-age benefits while Italy

[9]This definition comes from European system of integrated social protection statistics.

[10]For this analysis, I do not consider survivors, family and children and housing benefits.

Figure 3: Social protection benefits in percentage of GDP (2009)



dedicates around 15% of its GDP to aid people in retirement.

This heterogeneity is due to the fact that in the last decay across Europe, there has been a huge number of reforms - dealing with sickness and disability policies - which reorganised the expenditure in social protection. Changes in policy tools and institutional reforms suggest a gradual shift in policy orientations. While social security policies have been interpreted, up to the recent time, only in terms of mere financial assistance, a new wave of reforms has instead recognised the need for a stronger support in order to help people with disabilities to stay in (or re-enter) the labour market.

This shift can be explained using two disability policy indicators.[11] The first one covers compensation measures or benefit programs (coverage, minimum disability level, disability level for a full benefit, maximum benefit level, permanence of benefits, medical assessment, vocational assessment, sickness benefit level, sickness benefit duration and unemployment benefit level and duration); a higher score means greater system generosity, with 50 being the maximum.

The second one covers employment or integration measures (coverage consistency, assessment structure, employer responsibility for job retention and accommodation, supported employment program, subsidised employment program, sheltered employ-

[11]See Sickness, Disability and Work: Breaking the Barriers, OECD (2010), pp. 87 for the analysis and table B.1 in Appendix for the sub-components details.

ment sector, vocational rehabilitation program, timing of rehabilitation, benefit suspension regulations and additional work incentives). A higher score indicates a more active approach, therefore more focused on the vocational rehabilitation and work incentives.[12]

Table B.4, in Appendix, provides general idea of disability policy typologies across Europe. The Nordic countries and Portugal have a higher score for compensation policy, while the United Kingdom is the least generous. Considering integration policies, Denmark, Norway and Finland register the highest score, whereas Mediterranean countries occupy the bottom of this ranking. In general, there seems to be a different policy patterns between North and South.

Figure A.1 shows the variation in policy attitude across countries. Countries with high scores on both scales have a comparatively stronger integration policy in place, but the generosity and accessibility of benefits is likely to mitigate the potential advantages in terms of incentives of the integration component. The situation is worst for those countries, which are characterised by low levels in both scores. Only few countries have a more predominant focus in the policies - either in compensation or integration. On the one side, Portugal, Greece, Ireland and Italy, have the strongest compensation orientations. On the other side, the Netherlands and the United Kingdom, followed by Denmark and Austria register the strongest attitude towards integration policy.

Deviation from the dash 45-degree line represents country orientation towards the two types of policies. The scores in the first dimension, encapsulating the benefit or compensation policy tools, range from around (or below) 20 in most English-speaking countries - with the least generous and least accessible benefit systems - to over 30 in the majority of the Nordic countries, Portugal and Germany. The scores in the second dimension, summarising the integration policy tools, span within a slightly less broader range; from around 15 in many south-European countries and Ireland to 25 points or more in Denmark, Germany, the Netherlands and Norway.

[12]See Table B.2 and B.3 in Appendix for the details.

3 Empirical strategy

3.1 Outcome of study

I am interested in estimating the impact of an adverse health shock on labour market outcomes. More specifically, I want to assess whether people who suffer from a health shock are more likely to stay in full-time job, or transit to other statuses, namely employed part-time, unemployed, retired or inactive. Since the focus of this paper is in the labour market transitions not induced by the availability of old-age retirement, I initially select full-time employee, aged between 17 to 63 years old.[13] Part-time employee and unemployed at t_1 are omitted within this analysis in order to make the sample homogeneous with respect to labour market participation decision.

3.2 Identification of the causal effect

I use the formal causal framework suggested by Neyman (1923), Roy (1951) and Rubin (1974), and recently adapted by Lechner and Vazquez-Alvarez (2011) and Garcia-Gomez (2011) for the health and labour case. The central difficulty in this body of literature is how to properly deal with the simultaneous realisation between labour market outcomes and a health shock, which is likely to generate endogeneity within the model. One possible approach would be to use some instruments of health status in a reduced form for labour outcomes. An alternative procedure consists in conditioning on sufficient information in order to have random assignment to treatment - in this context health shock - and then using a parametric model where the treatment variable is one of the regressors (Smith, 2004). The author assumes the exogeneity of the onset of a health shock in the labour equation (conditional on a set of observed characteristics). The approach of Lindeboom et al. (2006) is similar. In fact, they estimate multinomial logits for different transitions between work and disability states where having had an accident is one of the explanatory variables. In this case the specification also allows for any remaining unobserved heterogeneity affecting health shocks and labour market/disability outcomes. These methods cannot be applied in this context because of data limitations.

In this study, the identification strategy involves matching individuals who undergo a health shock with their counterpart in a control group, using the propensity score matching method.[14] Let $T = 1, 0$ define the treatment indicator for a health shock

[13]In this literature - see for instance Garcia-Gomez (2011) - the selected individuals are between 17 to 65 or 70. Here, when I select individuals who are full-time workers and in good health in t_1, I found the oldest ones aged 63 years old.

[14]See Becker and Ichino (2002) for an overview of some propensity score matching estimators.

and the lack of treatment, respectively. Y_{1i} (Y_{0i}) defines the outcome of the interest for treated individuals (untreated).[15] The realisation of both two outcomes for the same individual is not observable to econometricians due to the lack of the counterfactual. Nevertheless, some features of the joint distribution can be estimated to obtain the Average effect of Treatment on the Treated (ATT) which can be written as follows.

$$ATT = E(Y_{1i} - Y_{0i} \mid T = 1) \tag{1}$$

The ATT determines to what extent the outcome of interest varies on average for those individuals i who suffer from health shocks (treated). However, the term $E(Y_{0i} \mid T = 1)$ is not observable. What I can observe is $E(Y_{0i} \mid T = 0)$, which is to say, the average outcome conditioning on not being treated. The difference between these two terms generates the well-known bias if T is not randomly assigned - Conditional Independence Assumption (CIA). The matter can be explained as follows.[16]

$$E(Y_1 \mid T = 1) - E(Y_0 \mid T = 0) = \tag{2}$$
$$= E\left(Y_1 \mid T = 1\right) - E\left(Y_0 \mid T = 1\right) + E\left(Y_0 \mid T = 1\right) - E\left(Y_0 \mid T = 0\right) = \tag{3}$$
$$= E\left(Y_1 - Y_0 \mid T = 1\right) + E\left(Y_0 \mid T = 1\right) - E\left(Y_0 \mid T = 0\right) = \tag{4}$$
$$= ATT + BIAS \tag{5}$$

Only in the case in which it is possible to ensure that the outcomes of the untreated are independent on the participation, it is feasible to consistently estimate the ATT. Thus, by conditioning on a set of observables, X, I assume what Rosenbaum and Rubin (1983) called the ignorable treatment assignment ($Y_0 \perp T \mid X$) under which I am able to estimate the ATT. In this context, if I suppose that Y_0 - the outcome of the individual without treatment - is not dependent on the treatment status T, the ATT can be properly estimated.[17] Using the Iterated Expectations Law and the Conditional Independence Assumption, the ATT can be estimated as follows.

$$ATT = E(Y_1 \mid T = 1) - E(Y_0 \mid T = 1) = \tag{6}$$
$$= E_x\left[(E(Y_1 \mid X, T = 1) - E(Y_0 \mid X, T = 1)) \mid T = 1\right] = \tag{7}$$
$$= E_x\left[(E(Y_1 \mid X, T = 1) - E(Y_0 \mid X, T = 0)) \mid T = 1\right] \tag{8}$$

In order to obtain better estimates, I guarantee that Common Support Condition (or

[15]In the rest of the analysis, untreated and controls are used indifferently.
[16]Index i omitted for notation simplicity.
[17]Thus, I assume $E\left(Y_0 \mid T = 1, X\right) - E\left(Y_0 \mid T = 0, X\right) = 0$.

Overlap) holds so that for each treated individual there is some counterparts in the control ones.[18] It is not trivial to estimate the ATT in equation 8 when conditioning on a large set of X, for this reason I follow the propensity score approach by Rosenbaum and Rubin (1983). They define the propensity score as the conditional probability of receiving the treatment - in this case an adverse health shock - conditioning on pre-treatment characteristics.

$$p(X) \equiv Pr(T = 1 \mid X) = E(T \mid X) \tag{9}$$

The authors demonstrate that if the participation in the treatment is random, once conditioning on the multidimensional vector X, it also has to be random within cells defined by the values of $p(X_i)$. Using the propensity score, the dimensionality problem is reduced and the ATT can be estimated as follows.

$$ATT = E(Y_1 \mid T = 1) - E(Y_0 \mid T = 1) = \tag{10}$$

$$= E_x \left[(E(Y_1 \mid p(x), T = 1) - E(Y_0 \mid p(x), T = 1)) \mid T = 1 \right] = \tag{11}$$

$$= E_x \left[(E(Y_1 \mid p(x), T = 1) - E(Y_0 \mid p(x), T = 0)) \mid T = 1 \right] \tag{12}$$

If the Balancing Hypothesis is satisfied, individuals with the same propensity score should show the same distribution of observable covariates, independently of their treatment status. Thus, I can consistently estimate the ATT ensuring - for a given propensity score - that the outcomes of the control group are on average the same of the treatment group. I estimate the propensity score using a probit model, stratifying individuals in blocks according to the propensity score and restricting the analysis to the common support option. Once having estimated the propensity score, I compute the ATT using both the Stratification method and the Kernel algorithm with replacement.

The Stratification Method is based on the same stratification procedure used for estimating the propensity score. By construction, in each block defined by this procedure, covariates are balanced and the assignment to treatment can be considered random. In the Kernel algorithm case, all treated individuals are matched with a weighted average of all the controls, with weights inversely proportional to the distance between their propensity scores (Becker and Ichino, 2002). The Kernel formula

[18] I use the min-max criterion so I exclude all the observations whose propensity score is smaller than the minimum and larger than the maximum in the opposite group. This is the interval of propensity score overlapping in the two groups.

for the matching estimators is as follows.

$$ATT = \frac{1}{N^T} \sum_{i \epsilon T} \left(Y_i^T - \frac{\sum_{i \epsilon C} Y_j^C \, G \frac{p_j - p_i}{h_n}}{\sum_{k \epsilon C} G \frac{p_k - p_i}{h_n}} \right) \tag{13}$$

Where $G(\cdot)$ is a Kernel function, h_n is a bandwidth parameter, T is the set of treated units and C the set of control units. Y_i^T and Y_j^C are, respectively, the observed outcomes of the treated and control units while C_i is the set of control units matched to the treated unit i with an estimated value of the propensity score of p_i. Finally, N^T is the number of units in the treated group.

The identification of the ATT relies on the CIA, which is to say that all the relevant characteristics for the selection into the treatment are accounted for, and the unobservables, left out, are not potentially correlated with the treatment. The applicability of this assumption - which is not testable - heavily depends on the availability of a detailed group of characteristics in order to match treated and controls (Caliendo and Kopeinig, 2008). The dataset used in this analysis points in this direction. Many variables on demographics, educational attainments, job characteristics and household composition are added in the model. Moreover, the information for both groups are collected with the same questionnaire, and individuals are drawn from the same local labour market. Heckman et al. (1997) stressed the importance of satisfying these two conditions in order to reduce the bias when applying matching estimators. Furthermore, I control for the pre-treatment characteristics within the vector of conditioning variables by including them in the propensity score and by restricting the sample of controls to individuals who are as similar as possible. Finally, I follow the simulation approach implemented by Nannicini (2007) and Ichino et al. (2008) in order to obtain valuable information on the reliability of matching estimates.

3.3 Health shock definition and determination of treatment and control group

I am interested in estimating the impact of a health shock on labour market outcomes at t_3 of individuals who are in good health at t_1 but become "disabled" thereafter, thus declaring disability at t_2 and t_3. This requires individuals to be observed for at least three consecutive years (2007-2008-2009). This sequence allows me to observe a period antecedent to disability (t_1) and some periods after this event - when the situation should be stabilised - in order to gauge the effects of the health shock on some relevant labour market outcomes. In particular, within the EU-SILC questionnaire, individuals report suffering from a daily limitation if the adverse shock occurs for a period of at least 6 months before the interview date. In this analysis, I use two measures of health shocks.

The first one describes limitation in daily activities due to health problems. It refers to the person's self-assessment of whether they are hampered in their daily activity by any on-going physical or mental health problem, illness or disability. From the three possible responses (namely *yes-strongly limited*, *yes-limited* and *not-limited*), I define the presence of an adverse health shock if they report having any limitation, regardless of its strength, in any given period (t_2 and t_3).

The second measure I use, it is based on the self-assessment individual's general health. From the five possible responses (namely *very good*, *good*, *fair*, *bad* and *very bad*), I consider individuals subject to an adverse health shock if they assess their health status as *fair*, *bad* and *very bad* in any given period.[19]

Considering the first measure of a health shock, the limitation is defined as the individual difficulties in performing the usual activity. Limitations should be due to a health-related cause and it is not meant to measure limitations due to financial, cultural or other none health-related causes. People with long standing limitations have passed through a process of adaptation, which may have resulted in a reduction of their activities. Thus, its main advantage is to capture the presence of long-standing limitations when it is likely to strongly influence labour market outcomes. This latter consideration makes the health indicator, examined in this paper, better with respect to the one widely used in the previous literature - chronic illnesses - because it is less heterogeneous and more specific in terms of considered ilnesses. The results do slightly change in terms of significance if I use general health as a measure of the health shock.[20]

Since I wish to evaluate whether suffering from an adverse health condition causes a change in labour market outcomes, I want to rule out possible simultaneity between the two phenomena. This is to say, I want to exclude the situation in which the anticipation of a future change makes a worsened self-reported health status. Using both measures of health status, I define two groups - treated and controls - following these selection criteria:

[19] I use this second measure because it does not directly refer to activities or labour market outcomes for robustness checks and in order to make the analysis comparable to what has been already done in the literature.

[20] The Spearman Rank correlation between the two variables is positive and significant ($rs = 0.41$). Moreover, the results are robust with respect to another measure of health within the questionnaire - suffering from any a chronic or long-standing illness. The estimates are available from the author upon request

1. All the individuals at t_1, the start of the sequence, report good health status and they are in full-time employment.

2. The treatment group is composed by individuals meeting selection criterion (1) who report suffering from limitations in daily activities in t_2 and t_3. Which is to say, those individuals who experienced a health shock after t_1 and for whom this adverse health persists at least over t_3. Individuals who suffer from a health shock (S) in all periods following the first one in which the individuals are considered healthy. I define the sequence $N_{t1}S_{t2}S_{t3}$, where S (N) stands for the person suffering (or not) from an adverse health shock.

3. The control group is composed by individuals meeting selection criterion (1) and who do not report a worsened health status after t_1. Thus, sequence $N_{t1}N_{t2}N_{t3}$ is observed.

The simultaneous determination of health and labour market status may arise, in the present context, via two different mechanisms. On the one hand, individuals may stay outside the labour market because they are recipients of benefits linked to disability policies, thus reporting low level of self-assessed health status. On the other hand, individuals may anticipate a transition out off employment and show a change in self-assessed health one period in advance. Both the two mechanisms are likely to generate reverse causality issue leading to incorrect inference. Thus, selecting only healthy individuals at t_1, which means having always the term N_{t1} at the beginning of the sequence for both treated and controls, should allow me to rule out or at least mitigate the just described reverse causality issue.[21]

Applying the mentioned selection criteria, I end up with a balanced panel of 52,064 individuals over the three years divided into twenty-six European countries. Each of the three consecutive year sequences defines pairs of mutually exclusive sub-samples - NNN and NSS.[22] Thus, individuals in the NSS group become disabled after the interview in t_1 and before the interview in t_2 of the sequence. In order to evaluate labour market outcomes appropriately, one should allow for the shock and their effects to stabilise over time. A reasonable approach is to measure outcomes at t_3, so two periods after the shock has occurred (Lechner and Vazquez-Alvarez, 2011). This strategy addresses the problem concerning the simultaneous effects of the health changes on labour outcomes (and vice versa).[23]

[21]Selecting the labour market participants who are aged 17 to 63 in the first period and have a zero degree of disability, allow me to consider only the individuals which are not induced to report limitation in daily activities because they are able to work full-time.

[22]I exclude the sequence NNS as in order for the shock to be persistent.

[23]I address (or at least mitigate) the reverse causality problem by ensuring that the adverse health

3.4 Descriptive statistics

I use longitudinal data from the European Union Statistics on Income and Living Conditions dataset (EU-SILC). This database has two main advantages. Firstly, the panel dimension allows me to account for the issue mentioned in the previous section. Secondly, being an harmonizing survey it enables a comparison among twenty-six European countries.[24]

The fundamental information (such as income, labour condition and social status) is collected both at the personal and the household level. The outcome variables in this analysis are transitions from full-time employment to five different labour market statuses. Namely, full-time employment to full-time employment (FT-to-FT), full-time employment to part-time employment (FT-to-PT), full-time employment to unemployment (FT-to-U), full-time employment to retirement (FT-to-R) and full-time employment to inactivity (FT-to-I). I will not look at other categories such as being a student, homemaker, looking after children or other persons, and being in community or military service.[25]

Table 1 summarises the labour market transitions from full-time employment to the other statuses. The smallest (largest) probability to stay in FT at t_3 is found in Latvia and Ireland (the Czech Republic and Finland). Furthermore, the Czech Republic (Iceland and the Netherlands) registers the smallest (largest) probability to move from FT-to-PT. Individuals living in Latvia (Norway) present the greatest (smallest) probability of being unemployed in 2009. No significant differences between countries are observed in retirement and inactive transitions.

The variables included in the model are: socio-economic characteristics (age, gender, marital status, household size, household income, consensual union and year of education); health status and job characteristics (number of years spent in a paid job, self-employed, sectors and work experience).[26]

The sample consists of 52,064 individuals divided into twenty-six countries and over the years 2007, 2008 and 2009. Table B.6, in Appendix, summarises the sample size for

shock occurs before the potential transition and change in the outcome of study. The only exception could be the case in which an individual anticipates a transition out of employment and show a change in self-assessed health one period in advance. In order to rely on the timing of events as a source of identification, I need to assume the lack of any anticipation effects even if it is unclear if this phenomenon might be empirically decisive.

[24]Even if I still have some cases of limited sample.

[25]See the Table B.5 for the description of the variables.

[26]I follow ISCO-88 (COM) International Standard Classification of Occupations: 1) Legislators, senior officials and managers; 2) Professionals; 3) Technicians and associate professionals; 4) Clerks; 5) Service workers and shop and market sales workers; 6) Skilled agricultural and fishery workers; 7) Craft and related trades workers; 8)Plant and machine operators and assemblers; 9) Elementary occupations. I drop Armed forces case.

Table 1: Percentage of individuals moving from FT-to-the other statuses

	Transitions from 2007 to 2009				
	FT-to-FT	FT-to-PT	FT-to-U	FT-to-R	FT-to-I
AT	0.89	0.04	0.04	0.03	0.01
BE	0.89	0.07	0.02	0.02	0.01
BG	0.87	0.02	0.08	0.02	0.02
CY	0.94	0.02	0.03	0.01	0.00
CZ	0.95	0.00	0.02	0.03	0.00
DK	0.90	0.05	0.02	0.03	0.00
EE	0.87	0.03	0.09	0.01	0.00
ES	0.85	0.03	0.10	0.01	0.00
FI	0.94	0.03	0.02	0.01	0.00
FR	0.90	0.03	0.03	0.03	0.00
GR	0.91	0.03	0.04	0.03	0.00
HU	0.90	0.01	0.05	0.03	0.01
IE	0.83	0.07	0.08	0.02	0.00
IS	0.88	0.08	0.03	0.00	0.00
IT	0.90	0.03	0.03	0.02	0.02
LT	0.88	0.03	0.07	0.01	0.00
LU	0.90	0.04	0.03	0.02	0.00
LV	0.79	0.03	0.14	0.02	0.01
NL	0.89	0.07	0.01	0.02	0.01
NO	0.93	0.05	0.01	0.01	0.00
PL	0.91	0.03	0.03	0.02	0.01
PT	0.90	0.01	0.07	0.01	0.00
RO	0.93	0.04	0.01	0.02	0.01
SE	0.89	0.06	0.04	0.01	0.00
SI	0.92	0.02	0.04	0.03	0.00
SK	0.91	0.01	0.04	0.01	0.02
UK	0.89	0.06	0.02	0.02	0.01
Total	0.92	0.03	0.04	0.02	0.01

Note: The different activity statuses are: Full-time (FT), Part-time (PT), Unemployed (U), Retired (R) and Inactive (I). EU-SILC (2009).

each group (individuals who suffer a health shock - NSS - and individuals who do not report a worsening in their health status - NNN), divided by country. In 2009, the largest percentage of people who did not experience an adverse health shock are located in the Scandinavian countries (Sweden and Norway), while Slovakia, Netherlands and Austria were found at the opposite position of this ranking.

4 Results

4.1 Estimation and main results

I estimate the propensity score for the individuals who undergo a change in their health status using a probit model. The probability of belonging to the NSS group is a function of the following characteristics: age, gender, marital status, household size, household income, consensual union and year of education, self-employer, sectors, work experience and health status.[27]

In order to satisfy the Balancing Hypothesis, I use a different specification for each country. I split the dataset into k strata of the propensity score and within each strata, I test that the average propensity score of treated and control does not differ.[28] Finally, I restrict the analysis to the Common Support. This improves the quality of the ATT (Becker and Ichino, 2002) because it implies that the test of the balancing property is applied only to observations whose propensity score lies on the intersection between the two supports of the propensity score of treated and the controls. Before estimating the ATT, I need to ensure that there are NNN individuals which are comparable to those NSS ones in terms of propensity scores. Figure 4 graphically presents the estimated propensity score for both treated and controls.[29] The distribution of scores among NSS and NNN in each country is similar, giving support to the Conditional Independence Assumption.[30]

Table 2 shows the main results using the Stratification ATT for the probability of having a different employment status at period t_3.[31] Each row presents the estimated effect of a drop in health status on the probability of staying in full-time employment or moving to part-time employment, unemployment, retirement or inactivity.[32] In most of the countries under analysis, individuals who undergo a health shock at t_1 exhibit a significant negative drop in the likelihood to remain in full-time employment at t_3 compared to those who do not. Individuals who suffer from a health shock shows a 10% lower probability of being in full-time job respect to the workers who do not report a worsened health status. Across Europe, this empirical evidence reveals that

[27]Propensity score estimates are available upon request.

[28]In order to satisfy the Balancing Hypothesis it is necessary that the means of each characteristic do not differ between treated and control.

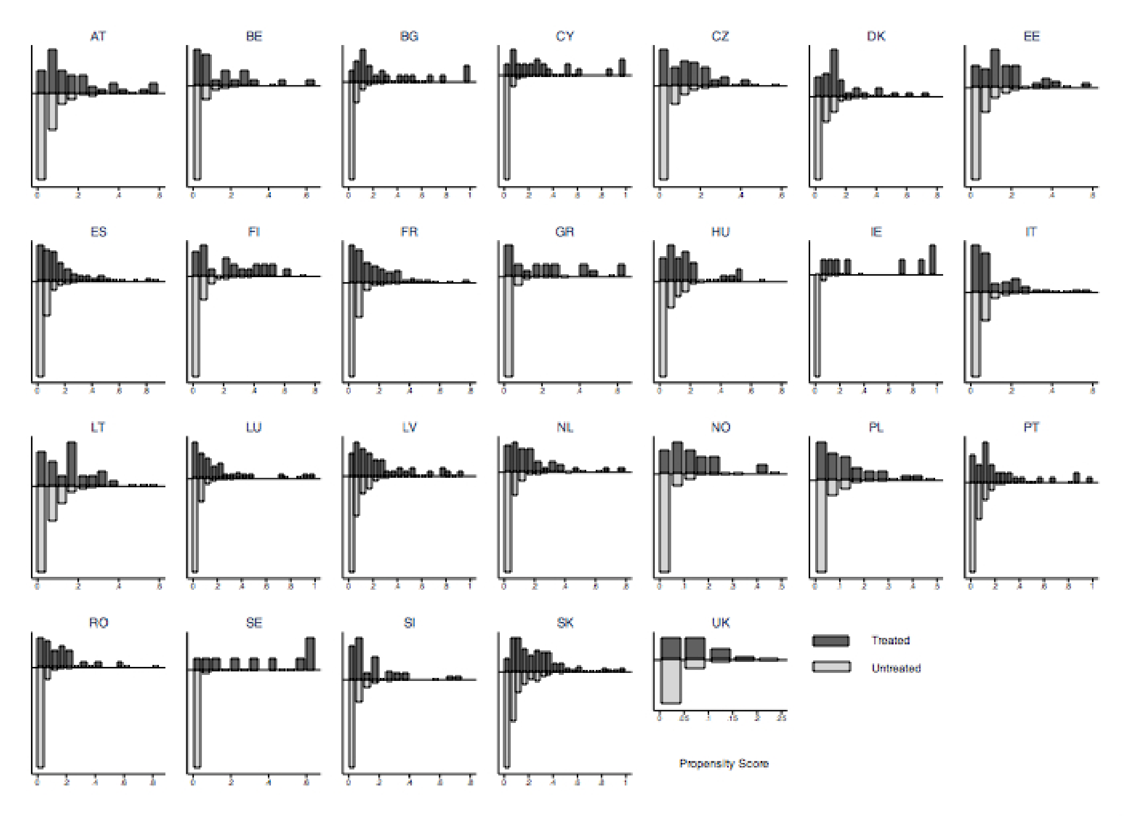
[29]I consider Support Overlap Condition which states that there is no value of covariates for which the probability of being treated is zero or one. The analysis only concerns values of X for which this probability is strictly between zero and one. In practice, this is implemented by imposing constraints on X such that this probability exceeds a threshold value strictly above zero and falls short of another threshold value strictly below one.

[30]In any event, all the estimates shown are obtained under the common support assumption.

[31]Full-time, Part-time, Unemployed, Retirement, Inactive.

[32]For each country, I bootstrapped the standard errors.

Figure 4: Estimated propensity score across countries



the individuals who are subject to a health shock presents a higher probability of being in part-time work, unemployment, retirement or inactive at t_3 respect to their "healthy" counterpart.[33]

These effects differ among countries. Where the probability of being in full-time job at t_3 is concerned, the greatest effect is found in Romania, Cyprus and Bulgaria, and the least in Slovakia, Latvia, respectively. The latter effect is not significant in the Scandinavian countries with the only exception of Denmark. This may be partly explained by the fact that Denmark does not have any quota regulation.[34] Furthermore, the compensation policies for Danish disabled people are among the most generous across Europe, discouraging $de facto$ the individuals to stay in full-time work (OECD, 2010). Regarding the Danish case, this paper suggests a stronger effect than Garcia-Gomez (2011) findings (-0.13 respect to -0.06). France, Italy and Portugal register a similar significant drop of around -0.08 in ATT full-time employment. Where

[33] The point estimates are around 1%, 4%, 3% and 2% for the transition FT-to-PT, FT-to-U, FT-to-R, FT-to-I, respectively.

[34] The quota regulation especially cover the public sector.

Table 2: Limitation in activities. ATT on the probability of several activity statuses

			Country						Country		
FT-to:	**FT**	**PT**	**U**	**R**	**I**		**FT**	**PT**	**U**	**R**	**I**
			AT						**LT**		
ATT	-0.188	0.061	0.064	0.046	0.016	ATT	-0.042	-0.034	0.021	0.022	0.032
Std. Err.	0.065	0.043	0.039	0.043	0.020	Std. Err.	0.073	0.013	0.056	0.049	0.038
			BE						**LU**		
ATT	-0.074	0.029	0.036	0.013	-0.004	ATT	-0.163	-0.009	0.127	0.024	0.022
Std. Err.	0.097	0.060	0.052	0.048	0.003	Std. Err.	0.078	0.032	0.060	0.038	0.022
			BG						**LV**		
ATT	-0.231	0.025	0.075	0.052	0.079	ATT	-0.002	-0.004	0.033	-0.008	-0.019
Std. Err.	0.103	0.041	0.074	0.053	0.050	Std. Err.	0.070	0.025	0.073	0.055	0.013
			CY						**NL**		
ATT	-0.315	0.114	-0.018	0.173	0.045	ATT	-0.034	-0.032	0.038	0.008	0.020
Std. Err.	0.124	0.073	0.050	0.105	0.048	Std. Err.	0.058	0.035	0.035	0.023	0.025
			CZ						**NO**		
ATT	-0.139	-0.006	0.042	0.104	-0.001	ATT	-0.102	0.131	-0.014	0.000	-0.014
Std. Err.	0.052	0.004	0.031	0.050	0.002	Std. Err.	0.124	0.116	0.012	0.000	0.015
			DK						**PL**		
ATT	-0.130	0.038	0.019	0.073	0.000	ATT	-0.029	0.024	-0.031	0.005	0.032
Std. Err.	0.102	0.072	0.053	0.062	0.000	Std. Err.	0.070	0.038	0.034	0.024	0.035
			EE						**PT**		
ATT	-0.089	0.022	0.036	0.031	0.000	ATT	-0.117	0.026	-0.029	0.032	0.088
Std. Err.	0.064	0.038	0.052	0.036	0.000	Std. Err.	0.068	0.036	0.044	0.047	0.045
			ES						**RO**		
ATT	-0.008	-0.016	-0.005	0.011	0.019	ATT	-0.316	0.033	0.030	0.255	-0.003
Std. Err.	0.045	0.012	0.037	0.023	0.015	Std. Err.	0.104	0.039	0.034	0.083	0.002
			FI						**SE**		
ATT	-0.047	-0.024	0.076	-0.002	-0.002	ATT	-0.048	0.090	-0.042	0.000	0.000
Std. Err.	0.069	0.014	0.067	0.002	0.002	Std. Err.	0.178	0.157	0.041	0.000	0.000
			FR						**SI**		
ATT	-0.080	0.033	0.057	-0.035	0.025	ATT	-0.106	0.055	0.066	-0.015	0.000
Std. Err.	0.043	0.023	0.030	0.014	0.014	Std. Err.	0.056	0.035	0.048	0.009	0.000
			GR						**SK**		
ATT	-0.043	-0.007	0.094	-0.043	0.000	ATT	0.001	0.002	0.029	-0.008	-0.024
Std. Err.	0.123	0.004	0.092	0.099	0.000	Std. Err.	0.037	0.009	0.021	0.023	0.022
			HU						**UK**		
ATT	-0.194	0.083	0.059	0.013	0.039	ATT	-0.005	0.045	-0.024	-0.015	-0.002
Std. Err.	0.111	0.061	0.074	0.043	0.040	Std. Err.	0.060	0.063	0.010	0.005	0.002
			IE						**EU**		
ATT	-0.114	0.200	-0.043	-0.043	0.000	ATT	-0.098	0.014	0.036	0.029	0.019
Std. Err.	0.336	0.208	0.267	0.042	0.000	Std. Err.	0.013	0.006	0.009	0.007	0.004
			IT								
ATT	-0.080	-0.021	0.018	0.026	0.057						
Std. Err.	0.039	0.010	0.023	0.022	0.026						

Note: ATT estimation with the Stratification Matching Method using Bootstrapped Standard Errors. I use limitation in daily activities because of health problems as a measure of a health shock. The different activity statuses are: Full-time (FT), Part-time (PT), Unemployed (U), Retired (R) and Inactive (I). For each country it shows number of treated and controls, respectively: AT(54;797); BE(22;612); BG(25;517); CY(22;302); CZ(61;2610); DK(35;439); EE(41;1125); ES(98;2768); FI(20;271); FR(117;3008); GR(17;369); HU(23;601); IE(5;25); IT(102;3506); LT(31;917); LU(46;1170); LV(48;946); NL(42;622); NO(14;419); PL(42;2110); PT(34;885); RO(28;791); SE(6;82); SI(44;609); SK(158;1711); UK(21;588); EU(1120;39997).

the point estimates, in Garcia-Gomez (2011) study, are not statistically significant for these countries, I conversely find a stronger effect than she infered in her paper.[35]

Across Europe the effect of a health shock on the transition probability from FT-

[35]In general, compared to the only close related paper (Garcia-Gomez, 2011), I find stronger negative causal effects from health on the probability of full-time work.

to-PT is positive. However, in some cases - namely Czech Republic, Greece, Finland, Italy and Lithuania - this effect turns negative. Apart from Finland, all the other countries register a low level of comprehensiveness of vocational rehabilitation (with the scores close to zero) and weak work incentives (the magnitude is around one), which may hamper the training, the re-qualification process and work reintegration in the labour market.

In France, Austria and Luxembourg, the estimates highlight a significant and positive effect in transiting from FT-to-U at t_3 for individuals who suffered from a daily limitation compared to those who do not (5%, 6% and 13%, respectively).

The effect on the transition FT-to-R reveals a significant and positive impact for the possibility of early retirement in Cyprus, Czech Republic and Romania due to a health shock. Despite using a sample with people aged below 63 years old, I still need to consider early retirement as an option even if it is not a well-defined state (Bardasi et al., 2002 and Disney et al., 1994).

The empirical analysis uncovers a significant and positive probability of switching from FT-to-I across Europe. In Bulgaria, France, Italy and Portugal, individuals who suffered from a health shock show a higher probability of being inactive at t_3 than those who do not report a "bad" health status (8%, 2%, 6% and 9% more than their counterpart, respectively). These countries are characterized by high sickness benefit duration, and a low score both in work incentives and monitoring. Thus, these facts may induce people to stay outside the labour market.[36]

The differences between countries in terms of likelihood of staying in full-time employment after a health shock occurs, may depend on the generosity of disability benefits provided in different countries, as previously argued in literature. The effect of ATT seems to depend on the kind of policy under which individuals suffering from a health shock receive generous benefits, i.e. they are more likely to exit the labour market after a health shock occurs, unless good integration policies are present in the country (ATT is not significant).[37]

I use a second indicator of a health shock defined as a drop in self-assessed general health to strengthen this analysis and make it comparable to what has been already done in the literature (Garcia-Gomez, 2011). Table 3 demonstrates that the results do not change substantially using this broader measure of a health shock. As expected, the magnitude of the effect is lower than the previous one given the fact that the former health shock measure should rule out cases which are considered as illnesses

[36]See table B.4 for all the score details.

[37]I would need to follow individuals over time to see whether they go back to work or transit to inactivity once the unemployment benefits expire. Unfortunately, the data at hand do not provide a large enough sample size to perform this analysis.

but do not strongly limit the usual work activity.

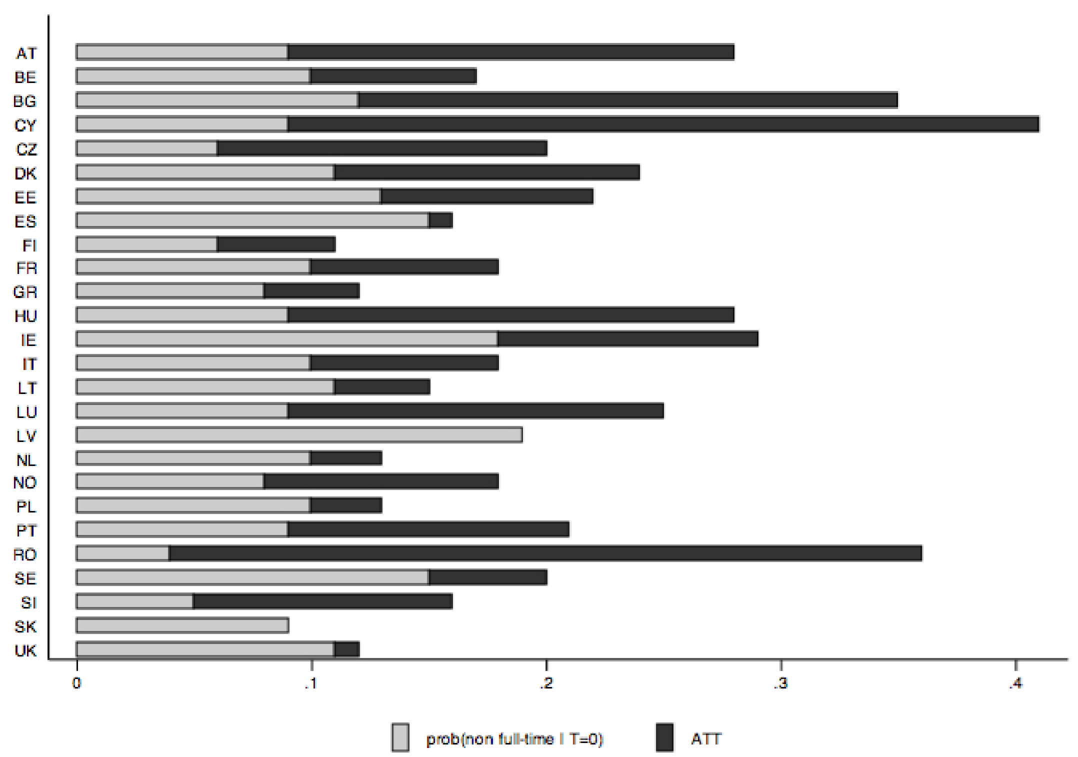
Table 3: General health. ATT on the probability of several activity statuses

			Country						Country		
FT-to:	**FT**	**PT**	**U**	**R**	**I**		**FT**	**PT**	**U**	**R**	**I**
			AT						**LT**		
ATT	-0.102	0.056	0.110	-0.060	-0.004	ATT	-0.056	0.012	0.022	0.024	-0.001
Std. Err	0.057	0.045	0.044	0.024	0.003	Std. Err	0.036	0.019	0.025	0.014	0.001
			BE						**LU**		
ATT	-0.034	-0.029	0.077	-0.010	-0.003	ATT	-0.126	0.035	0.053	0.025	0.012
Std. Err.	0.082	0.061	0.058	0.008	0.002	Std. Err.	0.051	0.028	0.032	0.026	0.014
			BG						**LV**		
ATT	-0.115	0.013	0.049	0.026	0.027	ATT	-0.087	-0.018	0.085	0.018	0.002
Std. Err.	0.055	0.034	0.038	0.025	0.019	Std. Err.	0.056	0.027	0.051	0.015	0.011
			CY						**NL**		
ATT	-0.013	-0.040	0.022	0.031	0.000	ATT	0.017	0.017	-0.008	-0.057	0.031
Std. Err.	0.078	0.024	0.054	0.044	0.001	Std. Err.	0.076	0.077	0.005	0.094	0.055
			CZ						**NO**		
ATT	-0.099	0.011	0.023	0.065	0.000	ATT	-0.209	0.202	0.015	-0.002	-0.006
Std. Err.	0.041	0.012	0.017	0.031	0.000	Std. Err.	0.094	0.087	0.032	0.002	0.006
			DK						**PL**		
ATT	-0.167	0.065	0.050	0.051	0.000	ATT	-0.029	0.028	-0.003	-0.021	0.024
Std. Err.	0.095	0.064	0.038	0.047	0.000	Std. Err.	0.032	0.019	0.020	0.016	0.018
			EE						**PT**		
ATT	-0.044	0.012	0.014	0.017	0.000	ATT	-0.063	0.002	0.073	-0.012	0.000
Std. Err.	0.047	0.027	0.038	0.023	0.000	Std. Err.	0.049	0.011	0.043	0.015	0.000
			ES						**RO**		
ATT	-0.058	-0.014	0.040	0.010	0.022	ATT	-0.089	-0.008	-0.013	0.117	-0.007
Std. Err.	0.043	0.017	0.034	0.015	0.015	Std. Err.	0.051	0.004	0.007	0.045	0.003
			FI						**SE**		
ATT	0.017	-0.028	-0.034	0.010	0.034	ATT	-0.163	0.034	0.129	0.000	0.000
Std. Err.	0.060	0.014	0.038	0.034	0.035	Std. Err.	0.101	0.095	0.082	0.000	0.000
			FR						**SI**		
ATT	-0.023	0.017	0.038	-0.035	0.004	ATT	-0.011	0.036	-0.019	-0.006	0.000
Std. Err.	0.031	0.017	0.023	0.020	0.006	Std. Err.	0.041	0.028	0.031	0.026	0.000
			GR						**SK**		
ATT	-0.358	0.104	0.166	0.091	-0.003	ATT	0.001	0.008	-0.011	0.019	-0.017
Std. Err.	0.113	0.061	0.068	0.063	0.003	Std. Err.	0.032	0.013	0.018	0.025	0.004
			HU						**UK**		
ATT	-0.036	0.011	0.049	-0.023	-0.002	ATT	0.017	-0.053	0.017	0.021	-0.001
Std. Err.	0.072	0.019	0.044	0.041	0.002	Std. Err.	0.060	0.034	0.038	0.035	0.002
			IE						**EU**		
ATT	-0.183	0.158	-0.084	0.109	0.000	ATT	-0.067	0.011	0.036	0.013	0.007
Std. Err.	0.229	0.166	0.055	0.152	0.000	Std. Err.	0.009	0.005	0.007	0.006	0.003
			IT								
ATT	-0.027	-0.007	-0.004	0.025	0.013						
Std. Err.	0.029	0.014	0.012	0.019	0.015						

Note: ATT estimation with the Stratification Matching Method using Bootstrapped Standard Errors. I use general health as a measure of a health shock. The different activity statuses are: Full-time (FT), Part-time (PT), Unemployed (U), Retired (R) and Inactive (I). For each country it shows number of treated and controls, respectively: AT(53;629); BE(29;594); BG(88;717); CY(39;549); CZ(136;1891); DK(35;382); EE(72;536); ES(127;2851); FI(29;511); FR(164;2664); GR(26;447); HU(57;417); IE(8;92); IT(178;3117); LT(126;474); LU(82;1315); LV(96;448); NL(20;463); NO(29;382); PL(136;2110); PT(89;557); RO(47;1438); SE(18;524); SI(69;535); SK(89;1280); UK(30;477); EU(1821;33389).

In order to better understand the relative importance of the negative effect of health shocks on the probability of leaving full-time employment it is convenient to compare it to the probability of not being in full-time employment that those individuals would have faced in the absence of health shocks. This is to say, computing the *ATT* with prob(Not full-time | T=0).[38] Figure 5 shows the significant relative magnitude of the effects of a health shock. In most cases, the adverse health shock more than doubles the chance of leaving the labour market. Moreover, Figure 5 does not suggest a clear association between the probability of leaving for the non-treated and the estimated *ATT*. For example, the estimated *ATT* is similar in Finland and Lithuania, but while in the former the probability of leaving the full-time employment without having had a health shock is low, in the latter is larger. Thus - in relative terms - Finland exhibits the largest effect. The significant deviations shown in figure 5 further confirm how heterogeneity disability policy orientation may explain the estimated differences between countries.

Figure 5: Probability of non full-time for treated individuals if they had not incurred a health shock and estimated ATT



[38]Note that prob(Not full-time | T=0) is the mean of prob(non full-time) at t_3 for control individuals. The ATT is the corresponding effect on the probability of being non full-time for treated individuals estimated by stratification matching.

4.2 Robustness checks and subgroup analysis

Table B.7 and B.8 show the estimates adopting an other matching algorithm - Kernel. The results for both measure of an adverse health shock appear quite similar respect to the one in Table 2 and 3. Moreover, the same model is estimated via OLS conditioning on the same set of covariates and Common Support. Also in this case, the effects do not dramatically differ from the main results in the previous section. Thus, they seem robust under the linear parametrization.[39]

Furthermore, I split the sample into two subgroups defined by gender and age, estimating the ATT on the probability of remaining in full-time employment.[40] The results for both subgroups - shown in Table B.10 and B.11 in Appendix - are coherent with the main findings, although significance is reduced in a few cases, especially for females. Probably due to the selection criteria, the male sample is generally larger than the female one (if the women tend to work more part-time the men, selecting full-time workers at t_1 may lead to a smaller female sub-sample). The lack of significance describe in the female sample suggests that the main findings are driven by the ATT on males. Generally, I conclude that the negative effect of a health shock increases with age.[41]

As a further check, I follow the simulation approach implemented by Nannicini (2007) and Ichino et al. (2008). They suggest a kind of sensitivity analysis which is not a test of the CIA which is intrinsically non-testable because the data are uninformative about the distribution of Y_{i0} for treated units, but it provides valuable information in order to draw conclusions on the reliability of matching estimates. In this contest, I recreate different confounders that attempt to violate the CIA. As recommended by Nannicini (2007), the results of this simulation-based sensitivity analysis should be read in terms of the deviation between point estimates rather than the changing in significant levels. This analysis reveals that the results are generally robust with respect to simulated confounders such as young, male, neutral and strong confounders (Table B.12 and B.13).

[39] See Table B.9 in Appendix for the results across countries.

[40] I define an individual as being young when I observe them in the 75th percentile of the age distribution (41 years old).

[41] In some cases, namely Austria, Hungary, Lithuania, Latvia and Slovenia, this effect is higher for young.

5 Health shocks and integration policy

In section 3, I advance the hypothesis that ATT differences across countries may be due to heterogeneity in institutional setup. As shown in section 2, the twenty-six European countries under analysis exhibit differences in both compensation and integration index scores. In this part of the analysis, I assess to which extent such heterogeneity is able to explain cross-country distribution of estimated $ATTs$. However, I focus only on the integration policy. The reason for this decision is that, as noted in section 2, European Union is pushing member states to shift from compensation policies to integration ones. The integration policy indicator, proposed by OECD, is composed by a set of ten different policy measures. I use Principal Components Analysis - PCA - in order to group some of these components according to their similarity and differences, simplifying the complex integration index provided by OECD.

This methodology permits to study the correlations of a large number of variables, grouping them around the factors highly correlated with each other (Dillon and Goldstein 1984). The main advantage of PCA is that, once these patterns have been found, it is possible to reduce the number of dimensions of the index - without loss of information. PCA extracts, from a set of variables, those orthogonal linear combinations to each other. This method is attractive for two reasons. Firstly, it is technically equal to a rotation of the dimensional axes, such that one can minimize the variance from the observations.[42] While the second reason is related to the fairly intuitive interpretation of the PCA. The coefficient of each variable is related to how much information it provides about the other variables.

I implement the PCA for the integration policy index in order to both reduce the dimensionality of data and to specify a linear factor structure between variables. Table 4 shows the principal components.[43] The resultant eigenvalues are then sorted by descending value. The largest eigenvalue is equal to the variance of the first principal component; the second largest eigenvalue is the variance of the second principal component, and so on for all ten entries in the sample covariance matrix. Almost 70% of the cumulative variation is due to the first three principal components while the last seven account for the remaining 30%.

I determine the number of principal components using the screeplot, which is the plot of the eigenvalues ordered from the largest to the smallest, shown in figure A.2. It visually demonstrates the proportion of total variance that each principal component

[42] This is equivalent to computing the line from which the orthogonal residuals are minimized. It is like implementing a regression in terms of minimizing residuals, but in this case the residuals are measured against all the variables, not just one dependent variable (Moser and Felton, 2007).

[43] The eigenvalues of the sample covariance matrix are calculated by the *pca* routine in STATA 12.

Table 4: Principal components of integration disability policy

Principal Component	Eigenvalue	Proportion of Variance	Cumulative Variance
1	3.57	0.36	0.36
2	1.72	0.17	0.53
3	1.38	0.14	0.67
4	1.09	0.11	0.78
5	1.02	0.10	0.88
6	0.46	0.05	0.92
7	0.33	0.03	0.96
8	0.24	0.02	0.98
9	0.13	0.01	0.99
10	0.07	0.01	1.00

Source: compiled by the author using data from OECD (2010).

is accounting for. Figure A.2 shows the screeplot for the ten principal components. Two components appear to be appropriate, by looking at the elbow in the screeplot.[44] Another important tool of PCA is the cosine squared shown in Table 5.[45] Components with a large value of cos_i^2 explain a relatively large portion of the total variance. I can interpret the first component in terms of vocational rehabilitation while the second one is more related to work incentives.

Table 5: Policy integration sub-components and cosine squared

Integration components	**PC1**	**PC2**	**PC3**	**PC4**	**PC5**	**PC6**	**PC7**	**PC8**	**PC9**	**PC10**
1-coverage consistency	0.01	**0.43**	0.32	0.00	0.17	0.00	0.00	0.05	0.02	0.00
2-assessment structure	**0.59**	0.01	0.11	0.01	0.08	0.04	0.13	0.02	0.01	0.00
3-anti-discrimination	0.14	0.19	0.11	0.43	0.09	0.01	0.01	0.02	0.00	0.01
4-supported employment	**0.54**	0.00	0.26	0.07	0.00	0.07	0.00	0.01	0.02	0.01
5-subsidised employment	0.28	**0.41**	0.13	0.05	0.02	0.03	0.00	0.07	0.00	0.01
6-sheltered employment	0.01	0.16	0.28	0.00	0.48	0.04	0.02	0.01	0.00	0.00
7-vocational rehabilitation	**0.79**	0.00	0.02	0.04	0.00	0.06	0.00	0.04	0.03	0.01
8-timing of rehabilitation	**0.65**	0.07	0.01	0.01	0.04	0.18	0.00	0.02	0.02	0.01
9-benefit suspension	**0.57**	0.01	0.00	0.09	0.14	0.01	0.17	0.00	0.01	0.00
10-work incentives	0.00	**0.45**	0.14	0.37	0.00	0.02	0.00	0.00	0.01	0.01

Source: compiled by the author using data from OECD (2010).

[44]The empirical rule to choose the principal components is to select the eigenvalues greater than one. Moreover, the principal components must explain at least the 50% of the total variance.

[45]This gives information about the importance of each component for a given observation and it indicates the contribution of a component to the squared distance of the observation from the origin. It corresponds to the square of the cosine of the angle from the right triangle made with the origin, the observation, and its projection on the component.

After isolating these two components, I proceed to assess the relationship between the estimated *ATT* on drop out from full-time employment and integration policy scores in terms of vocational rehabilitation and work incentives. The strength of this association is investigated trough a standard OLS regression. Table 6 presents the OLS results under four specifications: columns (1) and (5) show the baseline regression for *PC*1 and *PC*2, respectively; (2) and (6) some labour macro variables, which may affect the benchmark results, are added (rate of employment, rate of unemployment and the logarithm of GDP); in (3) and (7) health related variables are included and, finally, in (4) and (8) I present the estimates for the full model. I estimate a positive and significant effect of work incentives on the *ATT* with the findings being robust and stable under different specifications. Encouraging work incentives for disabled people has a positive impact on *ATT*, pushing it towards zero. In other words, individuals living in countries characterised by higher work incentives within disability policies are less likely to drop out from full-time employment after a health shock occurs. I do not find any significant evidence for vocational rehabilitation relation.

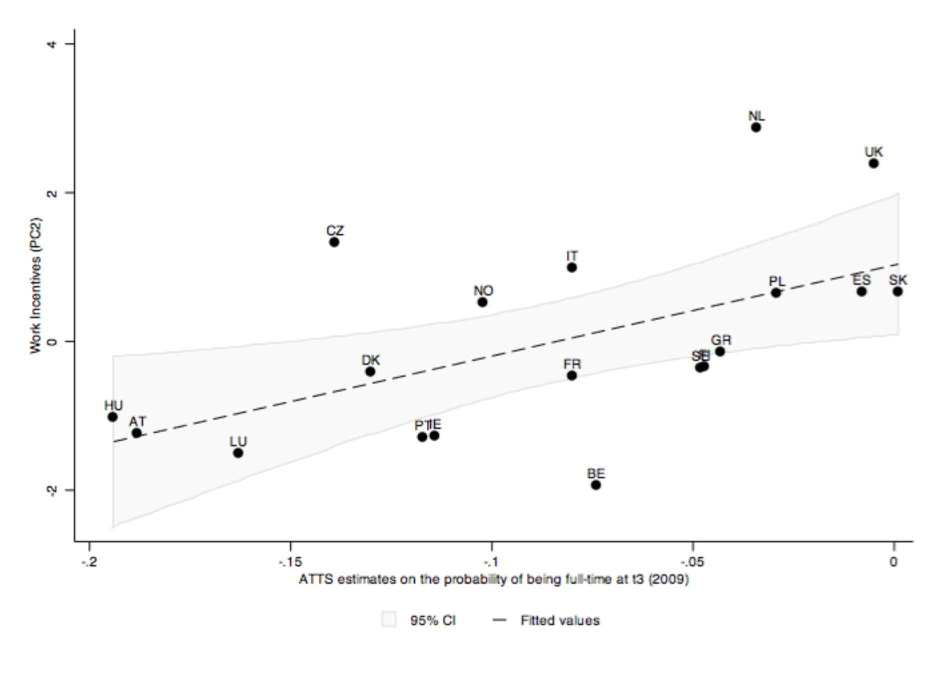
Table 6: PCA and ATT of leaving the full-time employment

Variables	First Component Full-time ATTS estimates				Second Component Full-time ATTS estimates			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PC	-0.007	-0.009	-0.019	-0.013	0.026**	0.030***	0.036***	0.035***
	(0.006)	(0.014)	(0.016)	(0.026)	(0.009)	(0.008)	(0.009)	(0.010)
total expenditure			-0.018	-0.014			-0.017	-0.002
			(0.049)	(0.062)			(0.039)	(0.045)
social protection			0.016	0.014			0.018	0.003
			(0.052)	(0.064)			(0.044)	(0.049)
sickness/health care			0.014	0.016			-0.004	0.001
			(0.019)	(0.028)			(0.008)	(0.018)
disability			0.023	0.019			-0.004	0.012
			(0.031)	(0.042)			(0.015)	(0.029)
unemployment			0.003	-0.004			0.028**	0.013
			(0.017)	(0.032)			(0.011)	(0.024)
rate of unempl.		0.008*		0.006		0.010**		0.006
		(0.004)		(0.012)		(0.004)		(0.009)
rate of empl.		0.005		0.002		0.000		-0.002
		(0.004)		(0.008)		(0.002)		(0.005)
ln(gdp per-capita)		-0.012		-0.029		0.015		-0.002
		(0.031)		(0.039)		(0.026)		(0.044)
Cons	-0.084***	-0.353	-0.180	-0.114	-0.084***	-0.332	-0.109	-0.076
	(0.014)	(0.405)	(0.146)	(0.724)	(0.012)	(0.313)	(0.137)	(0.669)
Obs.	19	19	19	19	19	19	19	19
R-squared	0.052	0.203	0.154	0.252	0.319	0.499	0.459	0.534

Note: ***Significant at the 1 %; **5%; *10% level. Standard Errors Clustered at the country level are reported in parentheses. Dependent variable is the ATTS estimates of being full-time worker in 2009 (t3). All the variables are from EUROSTAT (2009). PC is the principal component: first for 1-4 columns and second for 5-8 columns, respectively. Total expenditure, social protection, sickness/health care, disability, unemployment benefit are all measured as a percentage of GDP. I consider rate of unemployment and rate of employment with individuals aged 15 to 64 years old.

Figure 6 graphically shows the just mentioned relationship. This analysis supports the reforms, which have been pushed by European Union. In fact, Figure 6 shows that the countries which have a relatively high level of work incentives register ATT estimates close to zero (the Netherlands, the United Kingdom, the Slovak Republic). A reasonable interpretation is that the policy focusing on work incentives helps people, who have had to face a health shock, to remain in full-time job. Differently, Hungary and Austria, with a relatively low score in this kind of incentives, may give a disincentive to remain in full-time employment. Figure A.3 confirms the fact that it does not exist any significant relation between vocational rehabilitation and ATT of leaving the full-time employment. Thus, work incentives appears more relevant than vocational rehabilitation in explaining the drop out from full-time employment.

Figure 6: Work incentives and ATT of leaving the full-time employment



By way of example, in the United Kingdom introduced a unique tax credit in 1999, later merged into the general Working Tax Credit. In addition, a new temporary earnings supplement - the Return to Work Credit - was introduced in 2003. Both credits constitute a wage top-up for people with disability in low paid employment to ensure working pays. Moreover, the latest disability benefit reform in the Netherlands, in 2006, improves work incentives by providing what is *defacto* a permanent in-work benefit for individuals with partial or temporary disability through a wage-related benefit payment. Other countries have made it easier to combine disability benefit receipt with income from work, sometimes by introducing or increasing earnings disregards (the Slovak Republic). In addition to the combination of work and benefits, the Slovak Republic has sought to promote employment of people with disability by extending the possibility of putting the benefit on hold while trying to work a certain period of time and being able to return to the benefit without reassessment. Such possibility was extended to two years or more at the end of the 1990s in Finland and Norway (Sickness, Disability and Work, 2010).

6 Conclusion

This study contributes to the literature about the impact of health status on socioeconomic conditions and labour market outcomes where the only close related paper is Garcia-Gomez (2011). It strengthens and improves the understanding of this branch of research quantifying the effects of an adverse health shock on the individual labour market transitions across Europe. Matching techniques are used to control for the non-experimental nature of the data.

The question I empirically address is: what is the effect of a health shock on labour market transitions across Europe? The empirical analysis reveals a significant causal effect of a health shock on the likelihood of leaving full-time employment. Individuals who incur an adverse health shock are significantly more likely to transit either into part-time, unemployment or inactive status. The pooled effect across Europe is negative. Nevertheless, the results differ across countries depending on the country-specific social security system. The largest effect is found in Romania, Cyprus and Bulgaria, ranging from 31% to 23% respectively. It is assessed close to zero in Slovakia and Latvia.

I employ some ideas coming from the literature on the evaluation of active labour market programmes and I adapt them to this particular panel data case. This non-parametric approach has the key advantage that its validity does not depend on arbitrary functional form assumptions such as other conventional econometric models but fully exploits the panel data dimension. In particular, I use the formal causal framework suggested by Neyman (1923), Roy (1951) and Rubin (1974), and recently adapted by Lechner and Vazquez-Alvarez (2011) and Garcia-Gomez (2011) for the health and labour case. The identification strategy involves matching individuals who undergo a health shock with their counterpart in a control group, using the propensity score matching method.

Furthermore, I provide some insight about the real effectiveness of disability policies in twenty-six European countries from 2007 and 2009, using the European Union Statistics on Income and Living Conditions dataset (EU-SILC). I argue that these discrepancies are explained through the heterogeneity in social security systems across Europe. Individuals living in countries characterised by higher work incentives within integration disability policies are less likely to drop out from full-time employment after a health shock occurred. It is therefore of great interest to empirically investigate this type of comparative analysis in view of the standardisation of EU policies.

This paper contributes to the existing literature in three different ways. Firstly, it deepens the understanding of the relationship between health and labour market dynamics, using a comparative empirical analysis among twenty-six European countries. Secondly, with respect to previous literature and in particular to Garcia-Gomez (2011), a different measure of a health shock is used - limitation in daily activities. The purpose of using this indicator is to isolate the presence of long-standing limitations, ruling out cases in which individuals are affected by chronic illnesses, which do not substantially limit their usual work activity. Finally, evidence on how heterogeneous effects of health shocks on labour market outcomes depend on social security arrangements across Europe is found.

This study proposes possible lines for future research. First, it would be of interest to analyse transitions between the different non-employment statuses in order to better understand an individual's transit from unemployment to inactivity and/or to employment once unemployment benefits expire. Another possibility is to determine the effect of disability on a household in order to evaluate the impact of the onset of disability, not only for the individuals but also for the economic situation of the household (in terms of the labour supply of the member in good health).

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Appendix A

Figure A.1: Disability policy orientation across EU (2009)

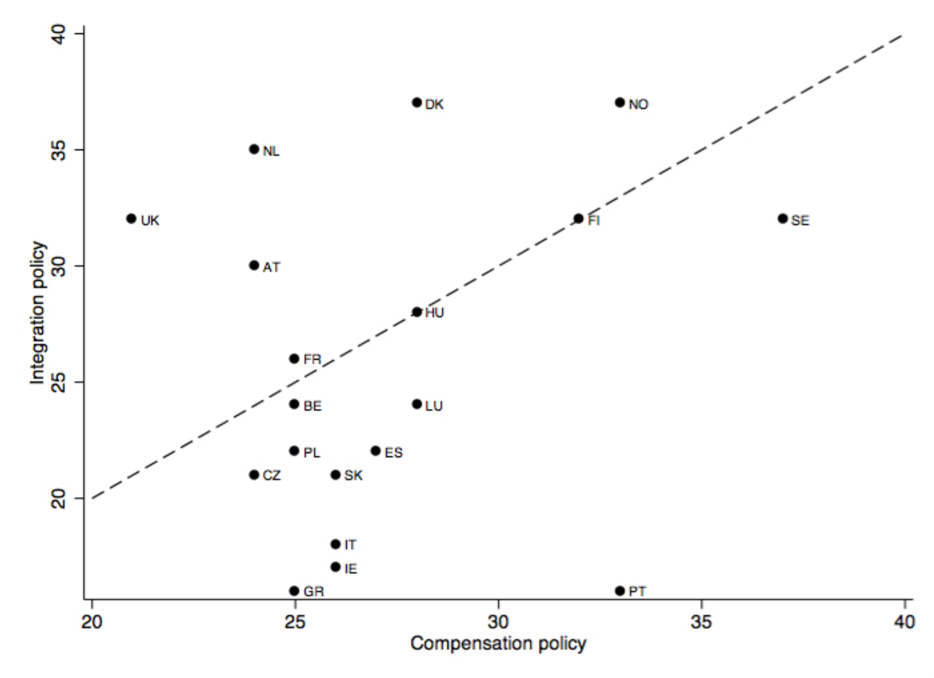


Figure A.2: Scree plot of the policy integration sub-components

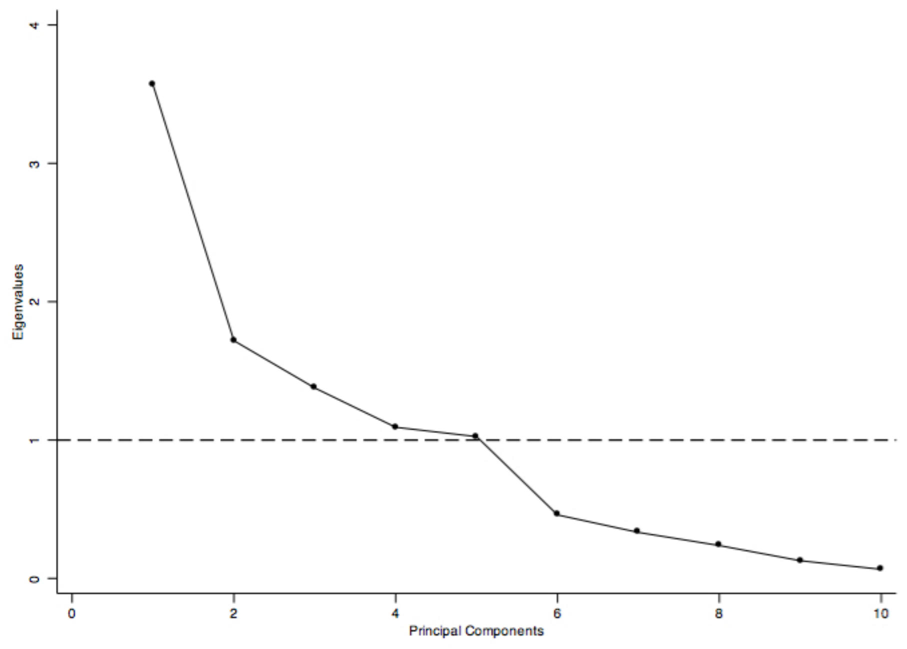
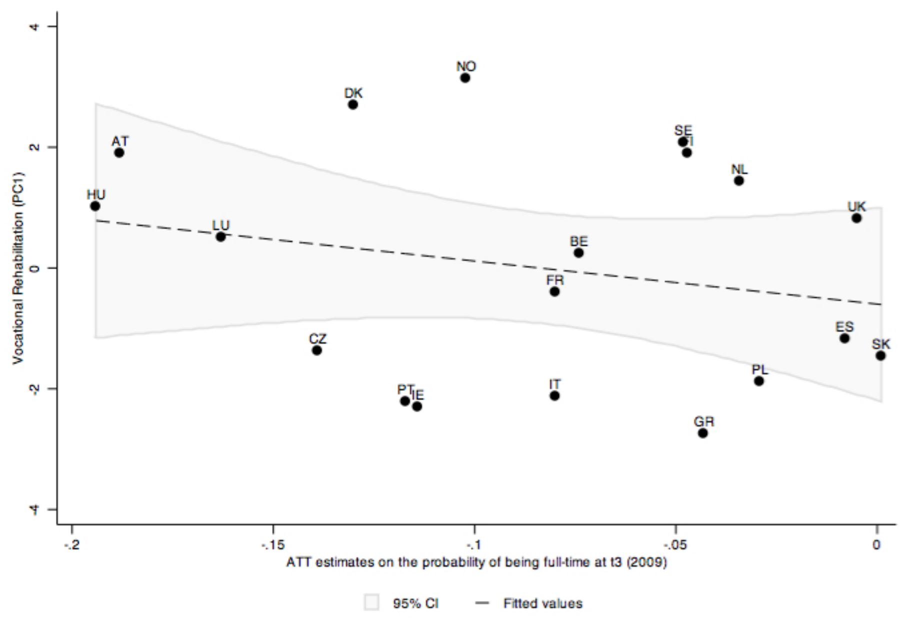


Figure A.3: Vocational rehabilitation and ATT of leaving the full-time employment



Appendix B

Table B.1: The sub-components of policy indicators

X	Description
1	coverage
2	minimum degree of incapacity needed for benefit entitlement
3	degree of incapacity needed for a full benefit
4	disability benefit level (replacement rate for average earnings with a continuous work record)
5	permanence of benefits (from strictly permanent to strictly temporary)
6	medical assessment
7	vocational assessment (from strict own occupation assessment to all jobs available)
8	sickness benefit level (distinguishing short and long-term sickness absence)
9	sickness benefit duration (including the period of continued wage payment)
10	sickness monitoring (from no checks on sickness absence to strict steps for monitoring)
Y	**Description**
1	coverage consistency (access to different programmes and possibility to combine them)
2	assessment structure (responsibility and consistency)
3	anti-discrimination legislation covering employer responsibility for work retention
4	supported employment programme (extent, permanence and flexibility)
5	subsidised employment programme (extent, permanence and flexibility)
6	sheltered employment sector (extent and transitory nature)
7	vocational rehabilitation programme (obligation and extent of spending)
8	timing of rehabilitation (from early intervention to late intervention)
9	benefit suspension regulations (from considerable duration to nonexistent)
10	additional work incentives (including possibilities to combine work and benefit receipt)

Source: compiled by the author using data from OECD (2010).

Table B.2: OECD disability policy typology: classification of the compensation indicator scores

X	**5 points**	**4 points**	**3 points**	**2 points**	**1 points**	**0 points**
X1. Population coverage	Total population (residents)	Some of those out of the labour force	Labour force plus means-tested non-contrib. scheme	Labour force with voluntary self-insurance	Labour force	Employees
X2. Minimum required disability	0-25%	26-40%	41-55%	56-70%	71-85%	86-100%
X3. Disability level for full benefit	¡ 50%	50-61%	62-73%	74-85%	86-99%	100%
X4. Maximum disability benefit payment level	RR ¿ = 75%	RR ¿ = 75%	75 ¿ RR ¿ = 50%	75 ¿ RR ¿ = 50%	RR ¡ 50%	RR ¡ 50%
X5. Permanence of benefit payments	Strictly permanent	De facto permanent	Self-reported review only	Regulated review procedure	Strictly temporary unless fully (= 100%) disabled	Strictly temporary in all cases
X6. Medical assessment criteria	Treating doctor exclusively	Treating doctor predominantly	Insurance doctor predominantly	Insurance doctor exclusively	Team of experts in the insurance	Insurance team
X7. Vocational assessment criteria	Strict own	Previous earnings	Own-occupation partial benefits	Current labour	All jobs available	All jobs available taken into account strictly applied
X8. Sickness payment level	RR = 100% also for long-term sickness absence	RR = 100% (short-term) ¿ = 75% (long-term) sickness absence	RR ¿ = 75% (short-term) ¿ = 50% (long-term) sickness absence	75 ¿ RR ¿ = 50% for any type of sickness absence	RR ¿ = 50% (short-term) ¡ 50% (long-term) sickness absence	RR ¡ 50% also for short-term sickness absence
X9. Sickness benefit payment duration	One year or more short or no wage payment period	One year or more significant wage payment period	Six-twelve months short or no wage payment period	Six-twelve months significant wage payment period	Less than six months short or no wage payment period	Less than six months significant wage payment period
X10. Sickness absence monitoring	Lenient sickness certificate requirements	Sickness certificate and occupational health service with risk prevention	Frequent sickness certificates	Strict follow-up steps with early intervention	Strict controls of sickness certificate	Strict follow-up steps

Source: compiled by the author using data from OECD (2010). Note: RR=replacement rate.

Table B.3: OECD disability policy typology: classification of the integration indicator scores

Y	**5 points**	**4 points**	**3 points**	**2 points**	**1 points**	**0 points**
Y1. Consistency across supports in coverage rules	All programmes accessible	Minor discrepancy flexible mixture	Minor discrepancy restricted mixture	Major discrepancy flexible mixture	Major discrepancy restricted mixture	Strong differences in eligibility
Y2. Complexity of the benefits and supports systems	Same agency for assessment for all programmes	One agency for integration benefits co-ordinated	Same agency for benefits and vocational rehabilitation	One agency for integration benefits not co-ordinated	Different agencies for most programmes	Different agencies for all kinds of assessments
Y3. Employer obligations for their employees and new hires	Major obligations towards employees and new applicants	Major obligations towards employees less for applicants	Some obligations towards employees and new applicants	Some obligations towards employees none for applicants	No obligations at all but dismissal protection	No obligations of any kind
Y4. Supported employment programmes	Strong programme permanent option	Strong programme only time-limited	Intermediary also permanent	Intermediary only time-limited	Very limited programme	Not existent
Y5. Subsidised employment programmes	Strong and flexible programme with a permanent option	Strong and flexible programme but time-limited	Intermediary either permanent or flexible	Intermediary neither permanent nor flexible	Very limited programme	Not existent
Y6. Sheltered employment programmes	Strong focus with significant transition rates	Strong focus but largely permanent employment	Intermediary focus with some ”new” attempts	Intermediary focus ”traditional” programme	Very limited programme	Not existent
Y7. Comprehensiveness of vocational rehabilitation	Compulsory rehabilitation with large spending	Compulsory rehabilitation with low spending	Intermediary view relatively large spending	Intermediary view relatively low spending	Voluntary rehabilitation with large spending	Voluntary rehabilitation with low spending
Y8. Timing of vocational rehabilitation	In theory and practice any time (e.g. still at work)	In theory any time in practice not really early	Early intervention increasingly encouraged	Generally de facto relatively late intervention	After long-term sickness or for disability recipients	Only for disability benefit recipients
Y9. Disability benefit suspension option	Two years or more	At least one but less than two years	More than three but less than 12 months	Up to three months	Some but not for disability benefits	None
Y10. Work incentives for beneficiaries	Permanent in-work benefit provided	Benefit continued for a considerable (trial) period	Income beyond pre-disability level allowed	Income up to pre-disability level also partial benefit	Income up to pre-disability level no partial benefit	Some additional income allowed

Source: compiled by the author using data from OECD (2010).

Table B.4: Disability policy typology: country scores (2009)

Countries	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	X total
AT	2	3	4	2	1	1	4	3	2	2	24
BE	3	2	3	1	4	2	4	2	2	2	25
CZ	1	4	3	3	0	2	1	0	5	5	24
DK	5	2	1	3	4	4	2	4	3	0	28
FI	5	4	4	3	2	3	2	3	3	3	32
FR	3	2	1	3	1	2	4	2	5	2	25
GR	3	3	2	5	2	1	3	2	2	2	25
HU	1	3	2	3	2	1	4	3	5	4	28
IE	3	1	2	1	4	3	2	1	5	4	26
IT	3	2	0	3	1	1	3	3	5	5	26
LU	2	1	2	5	3	2	2	5	4	2	28
NL	4	4	2	3	2	1	0	4	4	0	24
NO	5	3	2	4	2	4	2	5	4	2	33
PL	3	3	4	4	0	1	3	3	2	2	25
PT	3	2	3	5	4	1	4	1	5	5	33
SK	1	4	3	2	4	2	1	2	5	2	26
ES	3	4	1	4	5	0	3	2	4	1	27
SE	5	5	1	5	4	3	1	4	4	5	37
UK	3	1	2	1	2	3	1	1	2	5	21
Countries	**y1**	**y2**	**y3**	**y4**	**y5**	**y6**	**y7**	**y8**	**y9**	**y10**	**Y total**
AT	2	3	3	4	4	2	5	4	0	3	30
BE	3	3	3	1	5	2	2	3	2	0	24
CZ	3	1	4	1	1	3	1	4	0	3	21
DK	4	4	2	3	5	2	5	4	5	3	37
FI	2	2	4	3	3	3	4	4	5	2	32
FR	3	2	3	3	5	4	1	2	0	3	26
GR	3	2	3	0	2	3	0	1	0	2	16
HU	2	3	4	3	3	2	3	2	4	2	28
IE	3	2	2	1	3	2	0	1	1	2	17
IT	4	2	4	1	1	2	0	2	0	2	18
LU	2	4	3	2	4	3	2	3	0	1	24
NL	4	4	4	2	2	4	4	4	2	5	35
NO	4	5	4	2	4	4	5	4	5	0	37
PL	4	2	2	0	3	4	2	2	0	3	22
PT	3	2	2	1	2	2	1	1	1	1	16
SK	3	2	4	2	2	3	0	2	0	3	21
ES	4	3	3	1	2	3	2	2	0	2	22
SE	3	4	5	2	4	3	3	3	5	0	32
UK	4	4	4	3	1	2	1	3	5	5	32

Source: compiled by the author using data from OECD (2010).

Table B.5: List of variables

	Description
1	General Health (Very Good Health - Good Health - Fair Health - Bad Health - Very Bad Health)
2	Male
3	Age
4	Age squared
5	Dummy that iteracts different classes of age with gender
6	Consensual Union
7	Household Size
8	Total Disposal Household Income
9	Number of Year Spent in a Paid Job
10	Self-Employed or Employee
11	Type of contract
12	Degree of urbanization
13	Occupation
14	Marital Status (Never married - Married - Separated/Widowed/Divorced)
15	Highest ISCED level attained
16	Dummy for years of experience (0-12 - 13-24 - 25-35 - 35-65 - 65+ Work Esperience)

Source: compiled by the author using data from EU-SILC (2009).

Table B.6: Sample grouped by NSS and NNN

Countries	NSS	NNN	% of NSS	% of NNN	Total
AT	68	1161	5.53	94.47	1229
BE	27	1340	1.98	98.02	1367
BG	29	1298	2.19	97.81	1327
CY	30	1260	2.33	97.67	1290
CZ	64	3366	1.87	98.13	3430
DK	36	738	4.65	95.35	774
EE	52	1599	3.15	96.85	1651
ES	134	3840	3.37	96.63	3974
FI	40	832	4.59	95.41	872
FR	137	3813	3.47	96.53	3950
GR	40	1720	2.27	97.73	1760
HU	78	2367	3.19	96.81	2445
IE	9	601	1.48	98.52	610
IT	140	4961	2.74	97.26	5101
LT	38	1617	2.30	97.70	1655
LU	52	1617	3.12	96.88	1669
LV	50	1222	3.93	96.07	1272
NL	53	921	5.44	94.56	974
NO	19	1178	1.59	98.41	1197
PL	66	4462	1.46	98.54	4528
PT	49	1300	3.63	96.37	1349
RO	46	2865	1.58	98.42	2911
SE	12	1152	1.03	98.97	1164
SI	49	1014	4.61	95.39	1063
SK	178	2169	7.58	92.42	2347
UK	33	1661	1.95	98.05	1694
Total	1544	51696	2.90	97.10	52064

Source: EU-SILC (2009).

Table B.7: Limitation in activities. ATT on the probability of several activity statuses

			Country						Country		
FT-to:	**FT**	**PT**	**U**	**R**	**I**		**FT**	**PT**	**U**	**R**	**I**
			AT						**LT**		
ATT	-0.175	0.047	0.068	0.044	0.016	ATT	-0.071	-0.029	0.024	0.043	0.032
Std. Err	0.063	0.041	0.044	0.033	0.019	Std. Err	0.074	0.018	0.059	0.049	0.027
			BE						**LU**		
ATT	-0.119	0.069	0.032	0.022	-0.005	ATT	-0.171	-0.007	0.132	0.025	0.021
Std. Err.	0.091	0.083	0.053	0.071	0.004	Std. Err.	0.089	0.035	0.058	0.045	0.020
			BG						**LV**		
ATT	-0.204	0.020	0.060	0.053	0.072	ATT	-0.044	-0.003	0.047	0.018	-0.017
Std. Err.	0.119	0.063	0.095	0.056	0.052	Std. Err.	0.080	0.025	0.070	0.058	0.025
			CY						**NL**		
ATT	-0.276	0.101	-0.019	0.154	0.040	ATT	-0.004	-0.058	0.038	0.005	0.019
Std. Err.	0.168	0.098	0.076	0.120	0.041	Std. Err.	0.068	0.052	0.032	0.027	0.025
			CZ						**NO**		
ATT	-0.195	-0.003	0.046	0.153	-0.001	ATT	-0.115	0.134	-0.009	0.000	-0.009
Std. Err.	0.053	0.004	0.033	0.045	0.001	Std. Err.	0.111	0.118	0.041	0.000	0.009
			DK						**PL**		
ATT	-0.176	0.048	0.060	0.068	0.000	ATT	-0.045	0.022	-0.015	0.007	0.031
Std. Err.	0.079	0.068	0.045	0.050	0.000	Std. Err.	0.052	0.039	0.025	0.022	0.032
			EE						**PT**		
ATT	-0.090	0.020	0.034	0.036	0.000	ATT	-0.179	0.022	0.036	0.039	0.083
Std. Err.	0.067	0.030	0.052	0.033	0.000	Std. Err.	0.109	0.028	0.068	0.046	0.049
			ES						**RO**		
ATT	-0.037	-0.015	0.013	0.021	0.018	ATT	-0.309	0.031	0.027	0.256	-0.004
Std. Err.	0.039	0.011	0.037	0.025	0.013	Std. Err.	0.096	0.036	0.032	0.090	0.003
			FI						**SE**		
ATT	-0.029	-0.026	0.060	-0.002	-0.003	ATT	-0.123	0.152	-0.029	0.000	0.000
Std. Err.	0.087	0.050	0.069	0.001	0.013	Std. Err.	0.167	0.114	0.016	0.001	0.000
			FR						**SI**		
ATT	-0.094	0.030	0.064	-0.025	0.024	ATT	-0.143	0.049	0.107	-0.013	0.000
Std. Err.	0.044	0.022	0.029	0.015	0.016	Std. Err.	0.063	0.039	0.055	0.013	0.000
			GR						**SK**		
ATT	-0.053	-0.012	0.089	-0.024	0.000	ATT	-0.035	0.002	0.030	0.017	-0.014
Std. Err.	0.175	0.020	0.096	0.108	0.000	Std. Err.	0.036	0.010	0.022	0.018	0.013
			HU						**UK**		
ATT	-0.237	0.074	0.039	0.052	0.072	ATT	0.010	0.036	-0.023	-0.020	-0.003
Std. Err.	0.098	0.051	0.056	0.056	0.059	Std. Err.	0.084	0.072	0.014	0.010	0.007
			IE						**EU**		
ATT	-0.170	0.108	-0.037	0.100	0.000	ATT	-0.122	0.014	0.042	0.047	0.019
Std. Err.	0.153	0.152	0.159	0.007	0.000	Std. Err.	0.012	0.006	0.010	0.008	0.005
			IT								
ATT	-0.093	-0.023	0.018	0.037	0.060						
Std. Err.	0.038	0.012	0.023	0.024	0.027						

Note: ATT estimation with the Kernel Matching Method with Bootstrapped Standard Errors. I use limitation in daily activities because of health problems as a measure of a health shock. The different activity statuses are: Full-time (FT), Part-time (PT), Unemployed (U), Retired (R) and Inactive (I). For each country it shows number of treated and controls, respectively: AT(54;797); BE(22;612); BG(25;517); CY(22;302); CZ(61;2610); DK(35;439); EE(41;1125); ES(98;2768); FI(20;271); FR(117;3008); GR(17;369); HU(23;601); IE(5;25); IT(102;3506); LT(31;917); LU(46;1170); LV(48;946); NL(42;622); NO(14;419); PL(42;2110); PT(34;885); RO(28;791); SE(6;82); SI(44;609); SK(158;1711); UK(21;588); EU(1120;39997).

Table B.8: General health. ATT on the probability of several activity statuses

			Country						Country		
FT-to:	**FT**	**PT**	**U**	**R**	**I**		**FT**	**PT**	**U**	**R**	**I**
			AT						**LT**		
ATT	-0.124	0.060	0.111	-0.043	-0.004	ATT	-0.055	0.010	0.024	0.024	-0.002
Std. Err	0.061	0.043	0.053	0.033	0.004	Std. Err	0.040	0.020	0.031	0.015	0.001
			BE						**LU**		
ATT	-0.053	-0.021	0.085	-0.007	-0.004	ATT	-0.133	0.035	0.056	0.030	0.012
Std. Err.	0.100	0.055	0.059	0.016	0.003	Std. Err.	0.051	0.036	0.045	0.025	0.011
			BG						**LV**		
ATT	-0.123	0.020	0.050	0.028	0.025	ATT	-0.100	-0.014	0.097	0.016	0.001
Std. Err.	0.063	0.024	0.044	0.035	0.019	Std. Err.	0.055	0.027	0.059	0.017	0.012
			CY						**NL**		
ATT	-0.037	-0.026	0.030	0.034	-0.001	ATT	-0.002	0.015	-0.012	-0.037	0.035
Std. Err.	0.063	0.017	0.049	0.053	0.001	Std. Err.	0.102	0.092	0.013	0.099	0.051
			CZ						**NO**		
ATT	-0.115	0.011	0.023	0.082	0.000	ATT	-0.205	0.202	0.012	-0.002	-0.007
Std. Err.	0.031	0.011	0.015	0.025	0.000	Std. Err.	0.100	0.080	0.035	0.001	0.018
			DK						**PL**		
ATT	-0.188	0.067	0.043	0.078	0.000	ATT	-0.047	0.031	0.004	-0.013	0.024
Std. Err.	0.083	0.055	0.043	0.045	0.000	Std. Err.	0.038	0.019	0.016	0.022	0.017
			EE						**PT**		
ATT	-0.042	0.012	0.013	0.017	0.000	ATT	-0.068	0.004	0.070	-0.006	0.000
Std. Err.	0.056	0.025	0.038	0.024	0.000	Std. Err.	0.046	0.011	0.040	0.013	0.000
			ES						**RO**		
ATT	-0.083	-0.009	0.056	0.014	0.022	ATT	-0.103	-0.004	-0.010	0.125	-0.007
Std. Err.	0.040	0.015	0.035	0.014	0.014	Std. Err.	0.047	0.005	0.012	0.060	0.004
			FI						**SE**		
ATT	0.001	-0.025	-0.023	0.015	0.033	ATT	-0.182	0.056	0.126	0.000	0.000
Std. Err.	0.077	0.018	0.046	0.055	0.032	Std. Err.	0.116	0.064	0.111	0.000	0.000
			FR						**SI**		
ATT	-0.044	0.013	0.038	-0.012	0.005	ATT	-0.012	0.034	-0.018	-0.004	0.000
Std. Err.	0.030	0.017	0.022	0.013	0.006	Std. Err.	0.054	0.025	0.033	0.039	0.000
			GR						**SK**		
ATT	-0.338	0.100	0.154	0.086	-0.003	ATT	-0.001	0.008	-0.010	0.026	-0.023
Std. Err.	0.120	0.078	0.101	0.059	0.002	Std. Err.	0.031	0.012	0.021	0.025	0.006
			HU						**UK**		
ATT	-0.037	0.013	0.039	-0.012	-0.002	ATT	0.011	-0.037	0.013	0.015	-0.002
Std. Err.	0.067	0.017	0.054	0.041	0.002	Std. Err.	0.061	0.040	0.035	0.038	0.003
			IE						**EU**		
ATT	-0.191	0.078	-0.068	0.181	0.000	ATT	-0.084	0.012	0.041	0.026	0.006
Std. Err.	0.219	0.103	0.057	0.104	0.000	Std. Err.	0.010	0.005	0.007	0.005	0.002
			IT								
ATT	-0.039	-0.008	-0.007	0.041	0.014						
Std. Err.	0.027	0.012	0.013	0.021	0.012						

Note: ATT estimation with the Kernel Matching Method with Bootstrapped Standard Errors. I use limitation in daily activities because of health problems as a measure of a health shock. The different activity statuses are: Full-time (FT), Part-time (PT), Unemployed (U), Retired (R) and Inactive (I). For each country it shows number of treated and controls, respectively: AT(53;629); BE(29;594); BG(89;716); CY(39;549); CZ(136;1891); DK(36;381); EE(73;535); ES(127;2851); FI(30;510); FR(164;2664); GR(26;447); HU(58;416); IE(10;90); IT(179;3116); LT(127;473); LU(82;1315); LV(97;447); NL(20;463); NO(29;382); PL(138;2108); PT(90;556); RO(47;1438); SE(18;524); SI(69;535); SK(90;1279); UK(30;477); EU(1821;33389).

Table B.9: Limitation in activities. OLS estimations

			Country						Country		
FT-to:	**FT**	**PT**	**U**	**R**	**I**		**FT**	**PT**	**U**	**R**	**I**
			AT						**LT**		
beta	-0.162	0.061	0.071	0.012	0.017	beta	-0.031	-0.029	0.008	0.019	0.034
Std. Err	0.042	0.026	0.026	0.021	0.010	Std. Err	0.056	0.030	0.047	0.020	0.006
			BE						**LU**		
beta	-0.101	0.047	0.038	0.020	-0.004	beta	-0.168	-0.004	0.128	0.023	0.022
Std. Err.	0.066	0.054	0.027	0.025	0.017	Std. Err.	0.044	0.028	0.029	0.020	0.004
			BG						**LV**		
beta	-0.203	0.027	0.071	0.031	0.075	beta	-0.035	-0.018	0.067	0.000	-0.014
Std. Err.	0.068	0.031	0.055	0.033	0.018	Std. Err.	0.059	0.024	0.051	0.021	0.016
			CY						**NL**		
beta	-0.267	0.113	-0.044	0.163	0.035	beta	-0.002	-0.044	0.033	-0.007	0.020
Std. Err.	0.066	0.033	0.053	0.036	0.012	Std. Err.	0.047	0.042	0.014	0.018	0.014
			CZ						**NO**		
beta	-0.138	-0.004	0.042	0.102	-0.002	beta	-0.083	0.115	-0.014	no obs	-0.018
Std. Err.	0.028	0.007	0.018	0.022	0.003	Std. Err.	0.070	0.065	0.023	no obs	0.022
			DK						**PL**		
beta	-0.160	0.050	0.047	0.063	no obs	beta	-0.026	0.021	-0.021	-0.004	0.030
Std. Err.	0.055	0.044	0.021	0.030	no obs	Std. Err.	0.045	0.025	0.029	0.019	0.020
			EE						**PT**		
beta	-0.069	0.013	0.032	0.023	no obs	beta	-0.098	0.016	0.013	-0.003	0.072
Std. Err.	0.053	0.028	0.044	0.016	no obs	Std. Err.	0.050	0.015	0.045	0.020	0.010
			ES						**RO**		
beta	-0.012	-0.014	-0.001	0.010	0.017	beta	-0.287	0.030	0.028	0.232	-0.003
Std. Err.	0.036	0.016	0.031	0.012	0.006	Std. Err.	0.038	0.013	0.019	0.028	0.013
			FI						**SE**		
beta	-0.032	-0.023	0.062	0.002	-0.009	beta	-0.075	0.111	-0.035	no obs	no obs
Std. Err.	0.055	0.036	0.040	0.014	0.014	Std. Err.	0.137	0.110	0.078	no obs	no obs
			FR						**SI**		
beta	-0.085	0.039	0.058	-0.035	0.023	beta	-0.112	0.058	0.072	-0.018	no obs
Std. Err.	0.028	0.017	0.018	0.015	0.005	Std. Err.	0.037	0.020	0.026	0.016	no obs
			GR						**SK**		
beta	-0.090	-0.012	0.089	0.013	no obs	beta	-0.022	0.002	0.026	0.005	-0.011
Std. Err.	0.072	0.029	0.055	0.043	no obs	Std. Err.	0.024	0.008	0.017	0.010	0.013
			HU						**UK**		
beta	-0.227	0.083	0.030	0.045	0.068	beta	0.001	0.044	-0.031	-0.011	-0.003
Std. Err.	0.060	0.018	0.046	0.030	0.018	Std. Err.	0.066	0.053	0.032	0.029	0.013
			IE						**EU**		
beta	-0.056	0.159	-0.132	0.029	no obs	beta	-0.093	0.017	0.033	0.025	0.018
Std. Err.	0.092	0.115	0.110	0.036	no obs	Std. Err.	0.009	0.005	0.007	0.004	0.003
			IT								
beta	-0.077	-0.020	0.019	0.021	0.057						
Std. Err.	0.030	0.018	0.017	0.013	0.014						

Note: OLS estimation obtained conditioning on the same set of covariates used for ATT estimates and the same common support. I use limitation in daily activities because of health problems as a measure of a health shock. The different activity statuses are: Full-time (FT), Part-time (PT), Unemployed (U), Retired (R) and Inactive (I). For each country it shows number of observations, respectively: AT(851); BE(634); BG(542); CY(324); CZ(2671); DK(474); EE(1166); ES(2866); FI(291); FR(3125); GR(386); HU(624); IE(30); IT(3608); LT(948); LU(1216); LV(994); NL(664); NO(433); PL(2152); PT(919); RO(819); SE(88); SI(653); SK(1869); UK(609); EU(28956). In same case (no obs) I do not have enough observations.

Table B.10: Limitation in activities. ATT estimates by gender

	Female				Male			
Country	Treated	Control	ATT	Std. Err.	Treated	Control	ATT	Std. Err.
AT	19	240	-0.173	0.118	35	456	-0.200	0.089
BE	7	163	-0.040	0.150	15	422	-0.120	0.114
BG	8	180	-0.070	0.163	15	173	-0.311	0.142
CY	6	85	-0.032	0.168	16	196	-0.422	0.144
CZ	30	940	-0.179	0.087	30	1437	-0.071	0.078
DK	18	231	0.001	0.133	15	168	-0.164	0.136
EE	20	335	-0.097	0.099	21	614	-0.090	0.098
ES	36	1024	-0.035	0.078	61	1629	0.000	0.052
FI	12	161	-0.042	0.095	8	82	-0.041	0.137
FR	47	1191	0.003	0.055	70	1753	-0.131	0.057
GR	9	171	-0.053	0.232	6	69	-0.089	0.175
HU	9	266	-0.225	0.154	14	235	-0.179	0.137
IE		no obs				no obs		
IT	36	1334	-0.029	0.067	66	1783	-0.107	0.057
LT	19	371	-0.091	0.096	12	415	-0.013	0.113
LU	16	381	-0.108	0.135	27	649	-0.206	0.086
LV	18	507	0.037	0.091	28	277	-0.024	0.112
NL	11	81	0.011	0.166	31	481	-0.045	0.057
NO	10	94	-0.095	0.156		no obs		
PL	22	1301	-0.067	0.089	20	691	0.023	0.089
PT	16	261	-0.043	0.077	18	495	-0.177	0.144
RO	14	389	-0.169	0.107	14	282	-0.471	0.155
SE	6	82	-0.048	0.181	4	36	-0.143	0.291
SI	44	609	-0.106	0.056	18	284	-0.166	0.105
SK	158	1711	0.001	0.035	73	749	-0.028	0.051
UK	21	588	-0.005	0.061	14	377	-0.019	0.071
EU	1120	39997	-0.098	0.014	623	23078	-0.120	0.019

Note: ATT estimation of being full-time worker at t_3 using the Stratification Matching Method with Bootstrapped Standard Errors. I use limitation in daily activities because of health problems as a measure of a health shock. In same case, I do not have enough observation to implement matching technique (no obs).

Table B.11: Limitation in activities. ATT estimates by age

	Young (17-40)				Old (41-63)			
Country	Treated	Control	ATT	Std. Err.	Treated	Control	ATT	Std. Err.
AT	16	269	-0.237	0.112	38	433	-0.167	0.076
BE	6	180	-0.107	0.185	16	387	-0.081	0.120
BG		no obs			21	382	-0.299	0.127
CY		no obs			20	245	-0.350	0.126
CZ	10	972	-0.089	0.098	51	1482	-0.148	0.063
DK	9	105	-0.100	0.103	22	292	-0.179	0.108
EE	10	460	-0.068	0.134	31	490	-0.102	0.092
ES	32	1310	0.085	0.073	65	1427	-0.052	0.058
FI		no obs			16	195	-0.100	0.086
FR	35	1336	-0.033	0.057	82	1580	-0.102	0.052
GR		no obs			15	148	0.027	0.134
HU	5	192	-0.327	0.236	18	298	-0.147	0.126
IE		no obs				no obs		
IT	33	1684	-0.047	0.067	69	1719	-0.092	0.054
LT		no obs			26	689	-0.036	0.075
LU	20	673	-0.154	0.114	26	428	-0.117	0.114
LV	10	422	-0.227	0.167	38	476	0.080	0.079
NL	13	122	0.071	0.104	27	330	-0.051	0.067
NO	6	56	-0.090	0.184	8	236	-0.142	0.200
PL	8	760	-0.008	0.142	34	1243	-0.032	0.076
PT	12	431	-0.112	0.145	22	351	-0.094	0.104
RO		no obs			25	476	-0.357	0.109
SE	2	44	0.212	0.104		no obs		
SI	18	271	-0.164	0.105	25	229	-0.063	0.067
SK	40	861	0.000	0.059	115	840	-0.015	0.034
UK	6	188	-0.089	0.153	15	327	0.027	0.069
EU	298	19902	-0.079	0.023	822	19823	-0.106	0.014

Note: ATT estimation of being full-time worker at t_3 using the Stratification Matching Method with Bootstrapped Standard Errors. I use limitation in daily activities because of health problems as a measure of a health shock. In same case, I do not have enough observation to implement matching technique (no obs).

Table B.12: Sensitivity analysis I

	No confounder		Young confounder				Male confounder			
	ATT	Std. Err.	ATT	Std. Err.	Out. Eff.	Sel. Eff.	ATT	Std. Err.	Out. Eff.	Sel. Eff.
AT	-0.188	0.065	-0.173	0.015	0.594	1.931	-0.118	0.009	3.293	1.074
BE	-0.074	0.097	-0.116	0.010	0.638	1.787	-0.118	0.009	3.293	1.074
BG	-0.231	0.103	-0.219	0.018	0.782	4.957	-0.204	0.007	0.970	1.296
CY	-0.315	0.124	-0.199	0.147	0.564	3.14E+19	-0.272	0.006	1.079	4.233
CZ	-0.139	0.052	-0.178	0.006	0.177	2.725	-0.194	0.000	1.435	0.983
DK	-0.130	0.102	-0.153	0.018	0.248	2.086	-0.170	0.012	2.456	0.642
EE	-0.089	0.064	-0.082	0.011	0.738	2.832	-0.090	0.001	0.992	1.104
ES	-0.008	0.045	-0.035	0.007	1.195	2.641	-0.037	0.001	1.160	1.083
FI	-0.047	0.069	-0.026	0.008	0.546	1.453	-0.024	0.012	1.476	0.828
FR	-0.080	0.043	-0.080	0.006	0.370	2.564	-0.093	0.002	1.684	0.926
GR	-0.043	0.123	-0.043	0.066	0.469	12.129	-0.040	0.038	1.711	1.040
HU	-0.194	0.111	-0.230	0.016	0.550	2.619	-0.237	0.012	0.929	0.771
IT	-0.080	0.039	-0.090	0.001	0.707	2.216	-0.093	0.001	2.062	1.100
LT	-0.042	0.073	-0.038	0.011	0.645	4.225	-0.067	0.004	0.880	0.556
LU	-0.163	0.078	-0.164	0.016	0.615	2.940	-0.172	0.009	2.788	1.089
LV	-0.002	0.070	-0.036	0.029	0.831	3.503	-0.041	0.011	0.661	1.692
NL	-0.034	0.058	-0.009	0.022	0.808	2.253	-0.002	0.006	3.630	0.692
NO	-0.102	0.124	-0.117	0.007	0.840	0.474	-0.099	0.017	4.560	0.518
PL	-0.029	0.070	-0.029	0.007	0.460	4.297	-0.044	0.004	1.717	0.872
PT	-0.117	0.086	-0.171	0.012	0.619	3.369	-0.178	0.005	1.042	0.970
RO	-0.316	0.104	-0.303	0.004	0.394	5.793	-0.308	0.002	1.385	0.663
SE	-0.048	0.178	-0.132	0.008	0.822	7.137	-0.136	0.020	2.591	10.919
SI	-0.106	0.056	-0.139	0.003	0.320	1.383	-0.144	0.001	1.153	0.945
SK	0.001	0.037	-0.031	0.007	0.928	4.969	-0.035	0.002	1.628	0.991
UK	-0.005	0.060	0.011	0.006	0.486	1.773	0.006	0.005	1.896	1.832

Note: Regression for Ireland is not run due to the lack of observations.

Table B.13: Sensitivity analysis II

	No confounder		Neutral confounder				Strong confounder			
	ATT	Std. Err.	ATT	Std. Err.	Out. Eff.	Sel. Eff.	ATT	Std. Err.	Out. Eff.	Sel. Eff.
AT	-0.188	0.065	-0.176	0.003	0.928	1.028	-0.195	0.012	3.392	3.134
BE	-0.074	0.097	-0.118	0.003	1.005	1.132	-0.143	0.021	3.947	6.994
BG	-0.231	0.103	-0.211	0.007	0.936	1.105	-0.217	0.039	3.818	5.235
CY	-0.315	0.124	-0.277	0.011	1.124	1.291	-0.288	0.027	3.375	16.173
CZ	-0.139	0.052	-0.194	0.001	0.974	1.073	-0.194	0.004	3.701	5.498
DK	-0.130	0.102	-0.175	0.004	0.899	1.171	-0.201	0.015	4.070	3.251
EE	-0.089	0.064	-0.089	0.001	0.959	1.085	-0.104	0.012	3.971	6.824
ES	-0.008	0.045	-0.035	0.003	0.985	1.132	-0.052	0.007	3.553	3.870
FI	-0.047	0.069	-0.025	0.006	1.073	1.911	-0.048	0.007	5.813	6.193
FR	-0.080	0.043	-0.094	0.001	1.024	0.911	-0.104	0.003	3.808	2.888
GR	-0.043	0.123	-0.060	0.035	0.921	1.076	-0.101	0.027	3.552	6.872
HU	-0.194	0.111	-0.238	0.011	1.032	1.063	-0.264	0.017	3.792	4.250
IT	-0.080	0.039	-0.092	0.001	0.983	1.098	-0.101	0.003	3.895	3.287
LT	-0.042	0.073	-0.070	0.002	1.073	1.063	-0.080	0.007	4.164	6.025
LU	-0.163	0.078	-0.166	0.014	1.068	0.842	-0.191	0.012	3.927	4.312
LV	-0.002	0.070	-0.044	0.007	1.026	1.110	-0.099	0.043	3.968	6.616
NL	-0.034	0.058	-0.006	0.014	1.275	0.999	-0.027	0.025	3.570	3.735
NO	-0.102	0.124	-0.112	0.006	1.107	1.622	-0.124	0.013	4.412	4.084
PL	-0.029	0.070	-0.045	0.001	1.045	0.962	-0.058	0.004	3.549	4.147
PT	-0.117	0.086	-0.176	0.004	1.050	1.184	-0.191	0.009	3.975	3.655
RO	-0.316	0.104	-0.309	0.002	1.044	1.158	-0.315	0.003	4.114	3.818
SE	-0.048	0.178	-0.130	0.012	0.914	3.168	-0.151	0.025	3.994	26.227
SI	-0.106	0.056	-0.143	0.002	0.930	1.252	-0.153	0.004	4.771	3.206
SK	0.001	0.037	-0.035	0.001	1.020	1.020	-0.057	0.009	4.002	3.002
UK	-0.005	0.060	0.011	0.004	0.995	1.172	-0.009	0.007	3.833	4.377

Note: Regression for Ireland is not run due to the lack of observations.