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Labour and income effects of caregiving across Europe: an evaluation using matching techniques*

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Abstract

This paper offers evidence on the effects of caregiving (i.e. looking after a dependent person within or outside the household) on labour outcomes such as employment, full time employment (conditional on employment), and income for women aged between 30 and 60 across different European countries. It does so by exploiting data from the European Community Household Panel (1994-2001) in order to match women who have become caregivers with "control" women who are deemed to be comparable in all relevant characteristics and compute a non-parametric measure of the effect of becoming a caregiver on the outcomes mentioned above. Our results suggest that, for women who are working before becoming a caregiver there is no statistically significant change in the chances of being employed. However, in the case of women who were not working prior to becoming a caregiver, there is a statistically significant decrease in the chances of entering employment. We also detect a negative and significant effect on labour income, which tends to be offset by a parallel increase in social transfers, except in the case of women with low levels of education in the Southern countries.

JEL classification: JI4, J2

Keywords: informal care, female labour force participation, ECHP, matching, ageing

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1. Introduction

European countries are predicted to follow a demographic ageing process over the next few decades, and the foreseeable consequences of this phenomenon raise social and economic concerns. They include the well-known debates about the sustainability of public pensions and public health care systems (European Commission, 2006). However, a less debated issue that deserves equal attention is the provision and financing of long-term care services for elderly people.

There are both supply and demand factors that over the next few years may affect the way in which developed countries take care of dependent people. On the demand side, even the most optimistic forecasts suggest significant increases in the number of dependent elderly people in most OECD countries over the next few decades (OECD, 2007). On the supply side, where the provision of informal care by families is a key issue in all developed countries (OECD, 2005), family structures are changing in ways that may affect that source of care (Heitmueller, 2007): increasing female labour force participation, lower marriage rates, fewer children, greater geographical mobility, and declines in intergenerational co-residence.

Although the aforementioned factors are common to nearly all European countries, the challenges that those changes pose for the way in which long-term care for elderly people is provided differ between countries. The fact that the challenges differ is due to the important differences between the current long-term care systems of European countries. In that respect, following the classification proposed by Bonsang (2007), three groups of countries should be recognised. The Nordic group, made up of the Scandinavian countries and Netherlands, is mainly characterised by: i) a broad public coverage of long-term care services (EC, 2006); ii) a high percentage of middle-aged women providing informal care, although of a low intensity and centred on activities related to practical tasks and paperwork (no personal care), iii) very low percentages of cohabitation between middle-aged people and elderly relatives (less than 2%), and iv) labour force participation rates of middle-aged women (50-59), who are the most likely to have a dependent elderly relative, above 70%. The characteristics of the second group of countries, those in the south of Europe, are the opposite of those of the previous group: i) a mean-tested system of public long-term care services ii) a lower percentage of middle-aged women involved in informal

care than in the Nordic countries, although providing far higher levels of care that also includes personal care, iii) intergenerational co-residence percentages that are six times higher than those of the Nordic countries, and iv) low labour participation rates among middle-aged women (less than 40%). The characteristics of the third group of countries identified by Bonsang, made up of the countries of Central Europe (Germany, Austria, France, etc.), can be situated somewhere in between those of the two previous groups.

Therefore, the challenges that demographic ageing poses for those three types of long-term care systems, fundamentally related to the mix between formal and informal care as well as to the evolution of female labour force participation, are clearly different. Thus, in the countries with formal, high-coverage services, the concern stems from the fact that demographic ageing provokes a future increase of the public expenditure that will be hard to meet; therefore, policy-makers see the incentivisation of informal care as a way of reducing pressures on public budget. In Southern European countries, the main concern is that the desirable increase in labour participation rates for future cohorts of middle-aged women is hindered by an increase in the demand for informal care motivated by population ageing; therefore, as Spain has recently done, attempts are being made to reconcile both objectives by universalising public long-term care services coverage.

Nevertheless, in both cases the impact that the provision of informal care has on labour behaviour becomes a crucial issue. Thus, for countries aiming to incentivise informal care in order to reduce future pressures on public budgets, the relationship between caregiving and employment will determine the "price" that such strategy may involve in terms of a lower female labour force participation. In turn, for those countries that are considering expanding the public coverage in order to avoid the higher demand for care eroding the objective of higher female participation rates, the relationship between caregiving and employment will determine to what extent that objective can be expected to be attained.

In recent years, in addition to existent previous literature for the US[1], several studies have analysed the relationship between informal care and labour behaviour in some European countries. Carmichael and Charles (1998), using the 1985 wave of the General Household Survey (GHS), found that in the UK providing an intensive level of informal care (>20h/week) affects the probability of employment among middle-aged women. In a later

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[1] Ettner (1994, 1996), Wolf and Soldo (1994), Johnson and Lo Sasso (2000), Pavalko and Henderson (2006).

paper, using the 1990 wave of the GHS, Carmichael and Charles (2003) found in addition that the negative effect of informal care on employment is more pronounced for women than for men. More recently, using the 2002 wave of the British Household Panel Survey (BHPS), Heitmueller (2007) analysed the effect of informal care on employment using an IV approach that controls for the possible endogeneity of informal care in the equation of labour participation. His results show that caregiving only reduces the probability of working in the case of people caring for someone living in the same household. In addition, using several waves of the BHPS (1991-2002), Heitmueller found similar results after estimating panel data models that control for the possible presence of unobserved heterogeneity. Finally, also using the BHPS 1991-2002, Heitmueller and Michaud (2006) analysed the relationship between informal care and employment through a multivariate dynamic panel data model that accounts for state dependence, feed-back effects and correlated unobserved heterogeneity. Again, their results show that caregiving only affects employment among co-residential carers.

In addition to that studies for the UK, there are some recent papers analysing the effects of informal care on labour outcomes in other European countries. Crespo (2007) uses data from the first wave (2004) of the Survey of Health, Ageing and Retirement in Europe (SHARE) to estimate the effects of informal care on female labour force participation in two triplets of countries in Southern Europe (Spain, Italy and Greece) and Northern Europe (Sweden, Denmark and the Netherlands). Her results indicate that the probability of women who provide an "intensive" level of care – i.e., on a daily basis– participating in the labour force is lower both in the group of Southern countries as well as in the group of Northern countries. Bolin et al. (2008), using also SHARE data and an IV approach, analysed the association between hours of extra-residential informal care and several labour outcomes (i.e. probability of employment, hours worked and wages). Their results suggest that extra-residential care of one's elderly parents is associated with significant costs in terms of foregone labour-market opportunities and that these effects vary between European countries. Finally, using 8 waves (1994-2001) of the European Community Household Panel (ECHP), Viitanen (2005) analysed the relationship between caregiving and employment through dynamic probit models that take into account unobserved heterogeneity, state dependence and attrition. Her results show that informal caregiving only has a negative influence on the probability of being employed in the case of Germany.

Thus, building on that previous research, the aim of this paper is to analyse the effects of caregiving on labour outcomes for women aged between 30 and 60 across different European countries. The main contribution is that we use treatment evaluation techniques in doing so. More specifically, using 8 waves of the ECHP (1994-2001), we match women who have become caregivers with "control" women who are deemed to be comparable in all relevant characteristics and compute a non-parametric measure of the effects of becoming a caregiver on labour outcomes such as labour participation and full time employment (conditional on employment). The panel nature of the ECPH is crucial in providing confidence about the possibility of comparing "treated" women with "control" women in this non-experimental setting. A second contribution is that, in addition to the effects of caregiving on labour behaviour, this paper also analyses to what extent it affects individual and household incomes as well as the receipt of social transfers. In addition, we analyse whether women from different age and educational groups respond differently to the onset of a caregiving episode by looking at the existence of heterogeneous effects. Finally, following a similar approach to that used in previous studies (Bolin et al., 2008; Crespo, 2007), we analyse separately three groups of countries (Southern, Continental and Scandinavian) that have important cultural and institutional differences regarding long-term care services provision and financing.

Our results suggest that, in the case of women who were working before becoming a caregiver there is no statistically significant change in the chances of being employed. However, in the case of women who were not working prior to becoming a caregiver there is a statistically significant decrease in the chances of entering employment. We also detected a negative and significant effect on labour income, which tends to be offset by a parallel increase in social transfers, except in the case of women with low levels of education in the Southern countries.

In the next section we describe the methodological approach. In section 3 we discuss features of the ECHP of special interest for this study. In section 4 we present the empirical results and, finally, in section 5 we conclude and discuss the main findings.

2. Methods

2.1 Outcomes of interest

In this paper we focus on labour market outcomes that could potentially be affected by becoming a caregiver. Although the care of dependent people can be supplied by both men and women, currently the bulk of care is provided by women, so we will ignore the male population in this study. Also, we are particularly interested in working age women, so we focus on the 30 to 60 age group. For that population group, the labour outcomes evaluated in this study are the probability of being in employment, the probability of working full time (conditional on being employed), and the levels of income from labour and other sources.

2.2 Estimating Average Treatment Effects on the Treated

As in any other evaluation exercise with non-experimental data, the problem in our setting consists in obtaining a credible counterfactual against which to measure the impact of becoming a caregiver. Let $T=1,0$ indicate "treatment", that is, becoming a caregiver, and lack of treatment, respectively, and let Y_{i1} and Y_{i0} denote the outcome of interest for individual i with treatment and without treatment, respectively. Since we will observe individual i either with treatment or without treatment, we cannot observe the distribution of the Treatment Effect $B_i=Y_{i1}-Y_{i0}$. Certain features of such distribution are, nevertheless, estimable. In particular, we may consider the Average Treatment Effect on the Treated

$$ATET= E(B|\ T=1)=E(Y_1-Y_o|T=1)$$

(1)

This magnitude measures how much the outcome of interest changes on average for those individuals who undergo the treatment. Clearly, simply computing the difference in the average outcomes of those in treatment and those out of treatment is open to bias. That is,

$$E(Y_1|T=1)-E(Y_0|T=0)=$$
$$E(Y_1|T=1)-E(Y_0|T=1)+E(Y_0|T=1)-E(Y_0|T=0)=$$
$$E(Y_1-Y_o|T=1)+E(Y_0|T=1)-E(Y_0|T=0)=$$
$$ATET+BIAS$$

(2)

Only if we can guarantee that the outcomes of the control group are equal on average to what the outcomes of the treatment group would have been in the absence of treatment does this consistently estimate the ATET. However, the labour outcomes of caregivers, had they not become caregivers, are not likely to coincide with the labour outcomes of the non-caregivers, even if we consider averages. For instance, caregivers might be older and less educated than non-caregivers, and those differences would, in general, lead to differences in employment rates between the two groups even if the first group did not supply care.

Now suppose that by conditioning on an appropriate set of observables, X, assignment to the treatment group becomes random (or, at least, independent of the outcomes). This is the conditional independence assumption (see Heckman et al. 1997 or Wooldridge 2002)

$$Y_o \perp T \mid X$$

(3)

This implies that

$$E(Y_0|T=1, X) - E(Y_0|T=0, X) = 0$$

(4)

Therefore, we could estimate the ATET from the difference in outcomes between treated and controls within each cell defined by the conditioning variables X (see Blundell and Costa Dias 2002). Using the law of iterated expectations and the conditional independence assumption, the ATET can be retrieved from observed data in the following way

$$ATET = E(Y_1 \mid T=1) - E(Y_0 \mid T=1) =$$
$$E_X[(E(Y_1 \mid X, T=1) - E(Y_0 \mid X, T=1)) \mid T=1] =$$
$$E_X[(E(Y_1 \mid X, T=1) - E(Y_0 \mid X, T=0)) \mid T=1]$$

(5)

The sample counterpart to equation (5) is

$$ATET = \sum_{i \in \{T=1\}} \left[Y_{i1} - \sum_{j \in \{T=0\}} W_{ij} Y_{j0} \right] w_i$$

(6)

where W_{ij} denote the weights attributed to control individual j when compared with treated individual i and w_i are weights for each one of the observations in the sample of the treated.

Equation (5) means that the treated are to be compared with controls with identical values in the vector of conditioning variables X. In terms of the weights appearing in equation (6), this means that $W_{ij} = 0$ if $X_j \neq X_i$. However, this turns out to be prohibitive in terms of data, as the size of cells of observations defined by the values of X will be small unless X has a small dimension. An alternative is to use the results of Rosenbaum and Rubin (1983, 1984) and condition on the probability of treatment as a function of X, P(X) since the conditional independence assumption also implies that

$$E(Y_0 | T=1, P(X)) - E(Y_0 | T=0, P(X)) = 0$$

(7)

Therefore, we could estimate the ATET from the differences in outcomes between treated and controls within each cell defined by values of P(X).

$$ATET = E(Y_1 | T=1) - E(Y_0 | T=1) =$$
$$E_{P(X)}[(E(Y_1 | P(X), T=1) - E(Y_0 | P(X), T=1)) | T=1] =$$
$$E_{P(X)}[(E(Y_1 | P(X), T=1) - E(Y_0 | P(X), T=0)) | T=1]$$

(8)

In practical terms, this requires matching treated individuals with controls on criteria based on the closeness of their P(X) score – also known as the "propensity score".

The ability of this estimator to retrieve consistently the ATET relies crucially on the adequacy of the conditional independence assumption. That is, that all factors that may affect treatment and the outcomes are included in the vector of conditioning variables. For this reason, the matching method applied to non-experimental data is often criticised for assuming away the potential biases induced by unobserved heterogeneity. In our context the criticism would be based on the reasonable observation that there may be women with a high preference for what we may loosely call "the traditional female" role leading to both a lower probability of employment and a greater probability of becoming a caregiver (with respect to observationally equivalent women with a lower preference for such a role).

Panel data –spanning periods before and after the treatment- afford the possibility to correct for the biases arising from this situation and we shall exploit some of these advantages in our analysis. Firstly, we can differentiate the outcomes of the treated and the controls in order to eliminate any unobservable fixed effects affecting selection into becoming a caregiver and the outcomes of interest.

Let the superscripts t and t+1 denote the time periods before and after treatment occurs. The identification assumption is now less stringent since it states that

$$(Y^{t+1}_0 - Y^t_0) \perp T \mid X$$

(9)

So that,

$$E(Y^{t+1}_0 - Y^t_0 \mid T=1, X) - E(Y^{t+1}_0 - Y^t_0 \mid T=0, X) = 0$$

(10)

And, therefore, the matching and "differences in differences" ATET can be estimated in the following way from observed data (Blundell and Costa Dias, 2002 and Blundell et al, 2004)

$$\text{ATET}_{\text{MDID}} = \sum_{i \in \{T=1\}} \left\{ \left[Y^{t+1}_{i1} - Y^t_{i1} \right] - \sum_{j \in \{T=0\}} W_{ij} \left[Y^{t+1}_{j0} - Y^t_{j0} \right] \right\} w_i$$

(11)

where W_{ij} and w_i have been defined before. The same reasoning about the propensity score applies to the ATET_{DID} estimator.

Secondly, we can use the standard ATET estimator of expression (8) including pre-treatment outcomes within the vector of conditioning variables. This procedure ensures that the vector X of conditioning variables includes the unobserved factors that may lead to biased estimations, and it can be done by either including these pre-treatment outcomes in the propensity score function or restricting the sample of controls to individuals who are identical in terms of pre-treatment outcomes.

2.3 Constructing treatment and control groups

Our measures for the status of caregiver are based on the responses to the following questions in the ECHP: "Do your present daily activities include, without pay, looking after children or other persons who need special help because of old age, illness or disability?" and "Does the person(s) being looked after (other than children) live in the household or elsewhere?". We will consider two types of treatment: (i) becoming a caregiver, regardless of the place where the person cared for lives (i.e. an affirmative answer to the first question), and (ii) becoming a caregiver for a live-in dependent person (i.e. an affirmative answer to the first question plus reporting the person cared for to be living in the same household). In both cases women who look after children are not considered to be caregivers for the purposes of this study.

As we discussed in the previous section, it is important to allow for unobserved factors affecting both the caregiving status and labour outcomes. Therefore, we carry out separate analyses for women who are in employment and women who are not employed. Also, since we wish to evaluate whether becoming a caregiver leads to changes in labour outcomes, we want to rule out the possibility that any potential anticipation of the change in labour status causes the change in the caring status. Accordingly, we adopt an empirical strategy -motivated by the procedures used by Lechner and Vázquez Alvarez (2004) and García Gómez and López Nicolás (2006)- in order to construct the treatment and control groups.

1) Consider a window of three years for each observed individual. This creates 6 possible sequences of three years over the time span covered by our data. We refer to those three years, regardless of the sequence, as t=1, t=2 and t=3.

   Analysis for women who are in employment:

2) For each sequence select individuals who are not giving care at t=1, the start of the sequence, and also are employed at t=1 and t=2

3) The **treatment group** are individuals meeting selection criterion # 2 who report being a caregiver in t=2 and t=3.

4) The **control group** are individuals meeting selection criterion # 2 who do not report being a caregiver in either t=2 nor t=3.

Analysis for women who are not in employment:

2') For each sequence select individuals who are not giving care at t=1, the start of the sequence, and also are not employed at t=1 and t=2

3') The **treatment group** are individuals meeting selection criterion # 2 who report being a caregiver in t=2 and t=3.

4') The **control group** are individuals meeting selection criterion # 2 who do not report being a caregiver in either t=2 nor t=3.

We shall match individuals in the treatment and control groups on the basis of the propensity score function (the arguments of which will be specified soon). Thus, we do not resort to first differences, but from the discussion in 2.2 it follows that we nevertheless exploit the longitudinal perspective of our data by conditioning on the labour status at times t=1 and t=2[2]. The ATET are estimated on the basis of observed outcomes at t=3.

3. Data

The analysis in this paper is based on data from the European Community Household Panel (ECHP) from 1994 to 2001. In addition to labour and caregiving variables, the ECPH includes a rich set of socioeconomic indicators (age, gender, education, health status, income, etc.) which allow us to include a rich set of covariates in the propensity score. The estimation of ATET using non-parametric matching techniques requires big sample sizes and, although the ECPH sample sizes are greater than those for the average socio-economic survey, the sequence of conditions described above results in a relatively small number of observations in the treatment groups. This prevents us from carrying out a separate analysis for each one of the countries represented in the ECHP and, in line with other studies in the literature (Crespo, 2006), we carry out separate analyses for groups of countries.

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[2] A similar strategy was adopted by Dano (2004) when evaluating the effects of road accidents on labour outcomes, and also by García-Gómez and López-Nicolás (2006) when evaluating the effects of a health shock on labour outcomes.

3.1 Country grouping: Institutional and cultural factors

The criteria that we have used to define these groups are related to factors that affect the phenomenon under study. These factors are (i) the overall participation rates of women aged 25-54 and (ii) the size of public expenditures in long-term care services as a percentage of GDP. According to those two dimensions, and on the basis of the data depicted in figure 1, the countries represented in the ECPH can be classified into three groups. The first group contains Spain, Greece, Italy and Ireland. Those countries, possibly as a consequence of their greater "familyism" (Esping-Andersen, 1999), are characterised by a low level of public expenditure on long-term care as a proportion of GDP, and –with the exception of Portugal- their rates of female participation in the labour force are far below those of the rest of the European countries. At the other extreme, the group composed by Denmark and Finland is characterised by rates of female labour force participation above 80% and levels of public expenditure on long-term care that exceed twice the European average. The third group of countries contains the UK, France, Belgium, the Netherlands, Germany and Austria. In this group the rates of participation in the labour force and the level of public expenditure on long-term care are intermediate. We shall refer to these three groups as "Southern", "Scandinavian" and "Continental", although the inclusion of Ireland in the first group and the UK in the third group appears counterintuitive given the usual meaning of their group names[3].

The ECPH data also bear out the expected differences between the three groups of countries that we have defined. Figure 2 presents the labour status of women who become caregivers (according to our definition for the treatment group) prior to the event. Before becoming a caregiver, only 37.9% of those women in Southern countries reported being employed. The corresponding figures for Continental and Scandinavian countries are 45.7% and 77.2%.

Figure 3 presents the differences between the modalities of care between the three groups. In the group of Southern countries nearly 60% of the women who become caregivers provide care within the household. In the case of the countries in the Continental and

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[3] These three groups are very similar to the classification proposed by Bonsang (2007) on the basis of the SHARE, with the exception of the United Kingdom and Ireland, which are not included in his proposal due to the fact that they were not among SHARE participants.

Scandinavian groups the corresponding proportion is 20%. In those two groups there are no substantial differences according to whether the caregiver works or not, but in the Scandinavian group only 15% of caregivers in employment provide care within the household, whereas the proportion among caregivers out of employment is around 30%.

3.2 Descriptive statistics

Table 1 shows that in the ECHP we can observe a total of 119405 women aged 30 to 60 in Southern countries, 90455 in Continental countries and 22934 in Scandinavian countries. The sample reduces if we condition on working (not working) in the two previous periods to 30755 (36602) in Southern countries, 26712 (19011) in Continental countries and 9505 (1969) in Scandinavian countries. The sample further reduces when we split it into the treated, as shown by the figures in the table.

In table 2 we present a first glimpse of the sort of effects that we are aiming to estimate. The figures correspond to the proportion of women who report to be working at t=3 in each of the treatment and control groups for the three country groups and the two modalities of caregiving that we are considering. In the upper panel of the table the figures correspond to women who were in employment before becoming caregivers, and the lower panel contains the corresponding figures for women who were not working. In the upper panel the difference of -3.4 percentage points (90.23 vs. -93.63) in the proportions of women in employment between the treated (any modality of caregiving) and control groups for the Southern countries would suggest that becoming a caregiver reduces the probability of being employed. However, those figures are most likely biased estimates of the ATET, as they are calculated according to expression (2). An illustration of the potential biases is given by the mean age of each group, in brackets below the rates of employment. The treated are on average older than the controls, so as long as age is negatively correlated with labour force participation and, as one might expect, positively correlated with the caregiver condition, the observed drop in the rate of employment could simply be due to the underlying effect of age.

In the following section we discuss how to estimate the ATET by means procedures that, as outlined in section 2, allow us to interpret them as the causal effects of becoming a caregiver on labour outcomes.

3.3 Propensity score, matching estimators and outcome variables

In order to implement the formulae for the ATET of section 2.2, we follow the procedures outlined by Abadie and Imbens (2002) and the Stata™ routines written by Abadie et al (2004). First we estimate the probability (by means of a logit specification) of becoming a caregiver, both for any modality of caregiving and for caregiving within the household. Thus, for those two modalities of treatment we obtain the "propensity scores" defined in section 2.2 in the six groups of analysis (working and non-working women in the three groups of countries).

The propensity scores are specified as flexible functions of age and gender, educational attainment, health status, household size, number of children in the household, marital status, job characteristics (only when we analyse working women), the logarithm of equivalent household income at the start of the sequence and country and wave interactions. Subsequently, we verify that those specifications satisfy the "balancing hypothesis". That is, there are no systematic differences in observable characteristics between treated and controls once we condition on the propensity score.

Next we match treated individuals with controls using two alternative methods: i) nearest neighbour matching, and ii) four nearest neighbours matching. Finally, we obtain the estimated ATET on the following outcomes: i) the probability of being employed, ii) the probability of being in full time employment (conditional on being employed), iii) total household income (all money figures are in equivalent units expressed in annual euro adjusted for purchasing power parity at 1994 prices), iv) total household labour income, v) total household private transfers, vi) total household social transfers xi) total personal income, xii) total personal labour income and xiii) total personal social transfers. We further divide total household social transfers according to the different sources, i.e., a) total household unemployment benefits, b) total household old age benefits, c) total household family-related allowances, d) social assistance allowances, e) sickness benefits.

4. Results

Table 3 contains the estimated ATET for women who are in employment before becoming caregivers either within or outside the household. The estimates for women who are not in employment before becoming caregivers either within or outside the household are presented in table 4. Finally, the ATET for becoming a caregiver within the household are presented in tables 5 (employed women) and 6 (non-employed women). The columns headed M1 contain the ATET estimate using the nearest neighbour match while the columns headed M4 contain the ATET estimate using the four nearest neighbours matches.

In order to easily visualise the results presented in the tables, we have also graphed the ATET and their 90% and 95% confidence intervals for a selection of outcomes. Figures 4 to 7 contain the ATETs of becoming a caregiver in either of the two modalities, and figures 8 to 11 show the corresponding figures for becoming a caregiver within the household[4].

<u>4.1 Effects of becoming a caregiver (either within or outside the household) for women who were previously working</u>

The point estimates for the ATET in figure 4 show that the probability of remaining in employment drops by around 1.6% in the Southern countries and by 1.9% in the Continental countries. On the other hand, it seems that caregiving has a positive effect on the probability of remaining in employment for women living in Scandinavian countries. This result is not unexpected, given that in Denmark and Finland family carers can be officially recognised and employed as carers with a salary, employment benefits and a pension (Mestheneous and Triantafillou, 2005). Therefore, some of the women that would have left the labour market (had they not become a caregiver) remain in employment as a caregiver. As shown in the graphs, however, the confidence intervals for those ATETs include 0.

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[4] The analysis for women who are caregiving at home is not done for Scandinavian countries as the sample size is too small (see table 1).

In Southern countries, labour household income significantly decreases (figure 6), although that is balanced by the concomitant increase in social transfers (figure 7); accordingly, the effect on total household income is null (figure 5). In table 3 we can observe that the social transfers that produce that balancing effect are old age benefits and sickness benefits. In the case of Scandinavian countries the general pattern is similar, i.e. a drop in labour income and a concomitant increase in social transfers, but the bulk of those transfers corresponds to sickness benefits (table 3). That is consistent with the fact that in the Scandinavian group caregivers tend to look after spouses rather than parents. In Continental countries, the point estimates for the ATET on total household income is greater than in Southern countries, but its confidence interval includes 0 (figure 5). Unlike in Southern countries and Scandinavian countries (for the case of sickness benefits), in the Continental group there are no significant effects on either labour income or social transfers (figures 6 and 7, and table 3).

The results (not shown) for the different educational groups confirm the general pattern described above[5]. However, in the Southern countries, total social transfers to the household are smaller than the drop in labour income for women with a lower level of education.

Concerning differences in ATETs regarding age groups (results not shown), we can firstly observe that women in the 30 to 39 age group in Southern countries who continue to work after becoming a caregiver have a 9% lower probability of being in full time employment. Secondly, in the Continental countries, we observe that total household equivalent income decreases by about €2000 when women aged 40 to 60 become caregivers. Finally, income from private transfers appears to increase by about €225 in the case of women aged 50 to 60 in the Continental countries after becoming a caregiver.

4.2 Effects of becoming a caregiver (either within or outside the household) for women who were not working previously

The results show that the ATET on the probability of working is negative (that is, women who become caregivers are less likely to enter employment) and significant in the Southern and Continental countries (figure 4). The size of the effects are 2.4% in Southern countries

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[5] These results are available from the authors upon request.

and 3.5% in Continental countries (table 4), but there are minor differences across educational groups (results not shown). The biggest impact, around 5%, is found in the case of women with secondary school education. In contrast, the effect for women with a higher level of education is null. Those smaller chances of employment have a substantial negative impact on household equivalent income amounting to around €1000 (figure 5). In this case we can observe that the smaller level of labour income (figure 6) is not compensated by social transfers (figure 7).

4.3 Effects of becoming a caregiver within the household for women who were previously working

For women who are working, becoming a caregiver to someone who lives within the same household causes similar effects to those found in the situations where care is given either within or outside the household. Thus, in general there are no statistically significant effects either on the probability of working or on total household income. However, we find that household labour income decreases in Southern countries, although such decrease is compensated by an increase in social transfers (table 5). The latter also increase in Continental countries.

4.4 Effects of becoming a caregiver within the household for women who were not working previously

We find a pattern of effects that is similar to the findings for the case of giving care either within or outside the household. However, the magnitude of the ATETs is greater in the current case. An exception is the probability of working for the Southern group of countries, where the corresponding ATET is null (table 6). This contrasts with the ATET estimate of -7% in the Continental group of countries. For both groups of countries we find that household total equivalent income is smaller after becoming a caregiver. In Southern countries the estimated ATET is around €3000. That magnitude varies across educational groups (results not shown): women in the secondary education group have the greatest estimated ATET whereas women in the higher education group have the smallest estimated ATET.

5. Discussion and conclusion

In this paper we have provided evidence on the effects of becoming a caregiver on the probability of employment and different measures of income for women aged 30 to 60 in the countries represented in the ECPH. Our main results suggest that, for women who are working before becoming a caregiver, there is no statistically significant change in the chances of being employed. This result is independent of whether care is given within or outside the household, and differs from previous evidence (Heitmueller and Michaud, 2006) which found that only individuals who give care at home adjust their labour supply.

In the case of women who were not working prior to becoming a caregiver there is a statistically significant decrease in the chances of entering employment. The magnitude of that effect is 2.5% in the Southern countries and 3.5% in the Continental countries. That differential effect according to prior employment status suggests that becoming a caregiver exacerbates the factors that maintain women out of employment, but does not significantly affect women who are in employment. This heterogeneity of effects highlights the importance of controlling for state dependence in labour outcomes in a full non-parametric way when assessing the causal effects of informal care.

Concerning the effects of becoming a caregiver on income, we detect a negative and significant ATET on labour income which tends to be offset by a parallel increase in social transfers, except in the case of women with low levels of education in the Southern countries, for whom we find that social transfers do not compensate the reduction in labour income. Since a large proportion of caregivers in the Southern countries look after their elderly relatives, and the main origin of the transfers in this group are old age benefits accruing to the dependent person, this particular result signals the inadequacy of a system whereby the only source of compensation for the caregiver is the pension entitlements of the receiver of the care.

Our results suggest an increase in the probability of working for women who become caregivers and were already employed in the countries belonging to the Scandinavian group. These results are consistent with the evidence found by Viitanen (2005) in Finland, and reflect the possibility for carers to be formally recognised as workers.
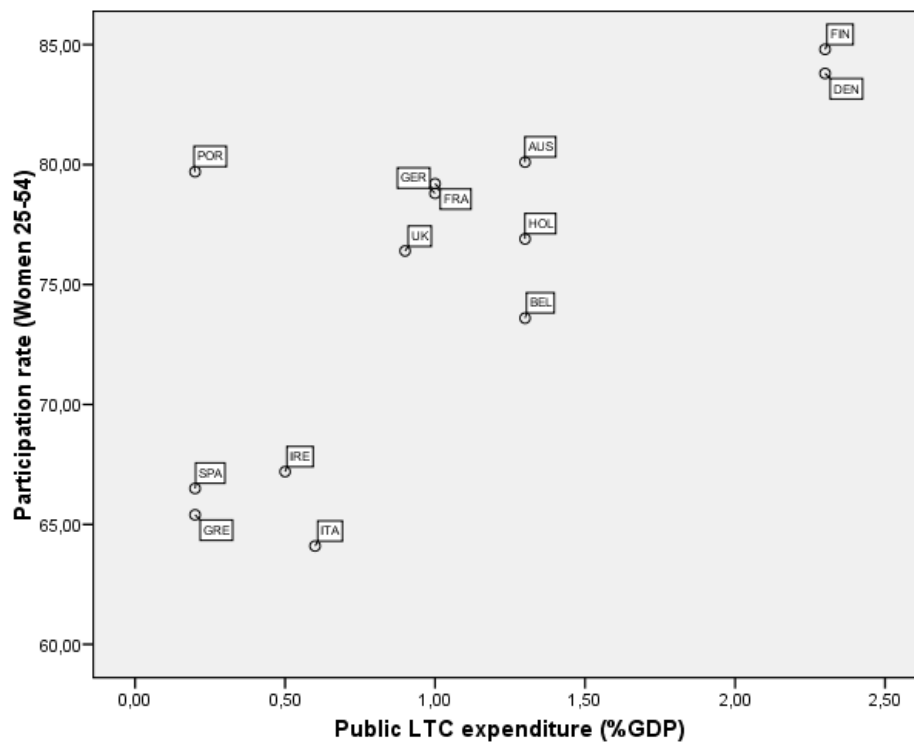
There are a series of methodological issues that call for further research. Firstly, there might be some measurement error in the interpretation of the responses to the question that allow us to create the caregiver indicator. That is, some women might report to be caregivers when in fact they are simply sharing a dwelling with an older relative. A way forward in this sense would consist of further refining the definition of caregiver by requiring a minimum level of hours dedicated to that task. A second important issue is the potential lack of statistical power of our procedures. This is a result of the small sample sizes of caregivers in some of the groups that we have considered, a common problem when the matching methodology is used (Browning et al, 2006). Further work should consider the calculation of statistical power measures and suggest possible ways to define groupings in the population of interest.

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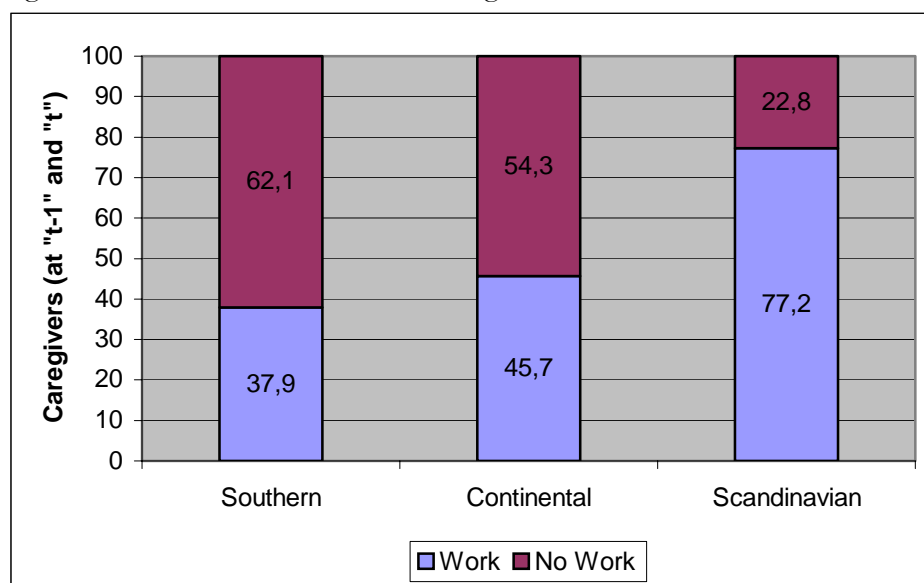
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Figure 1. Public Long Term Care Expenditures and Female Labour Force participation across Europe.
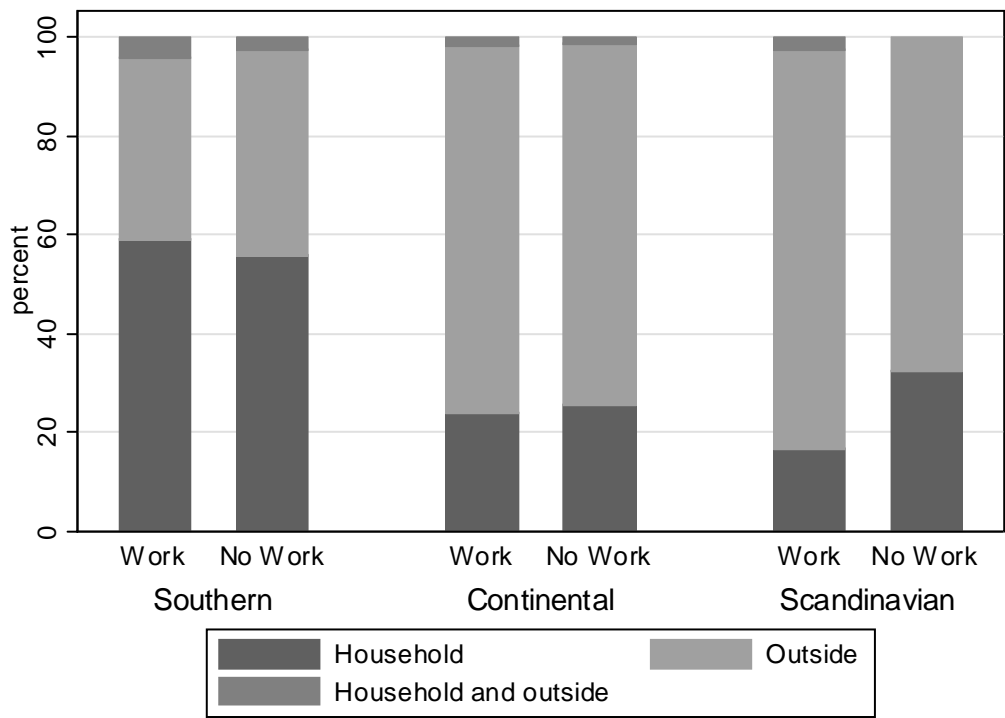

Source: Public LTC expenditures in 2003 (OECD, 2006). Women labour participation rates in 2003 (European Commission, 2006).

Figure 2. Previous labour status of caregivers

Source: ECHP. Women aged 30-60

Figure 3. Where do individuals in different countries provide care?

Source: ECHP. Women aged 30-60

Figure 4. Average treatment effect on the treated on the probability of working. Treatment caregiving
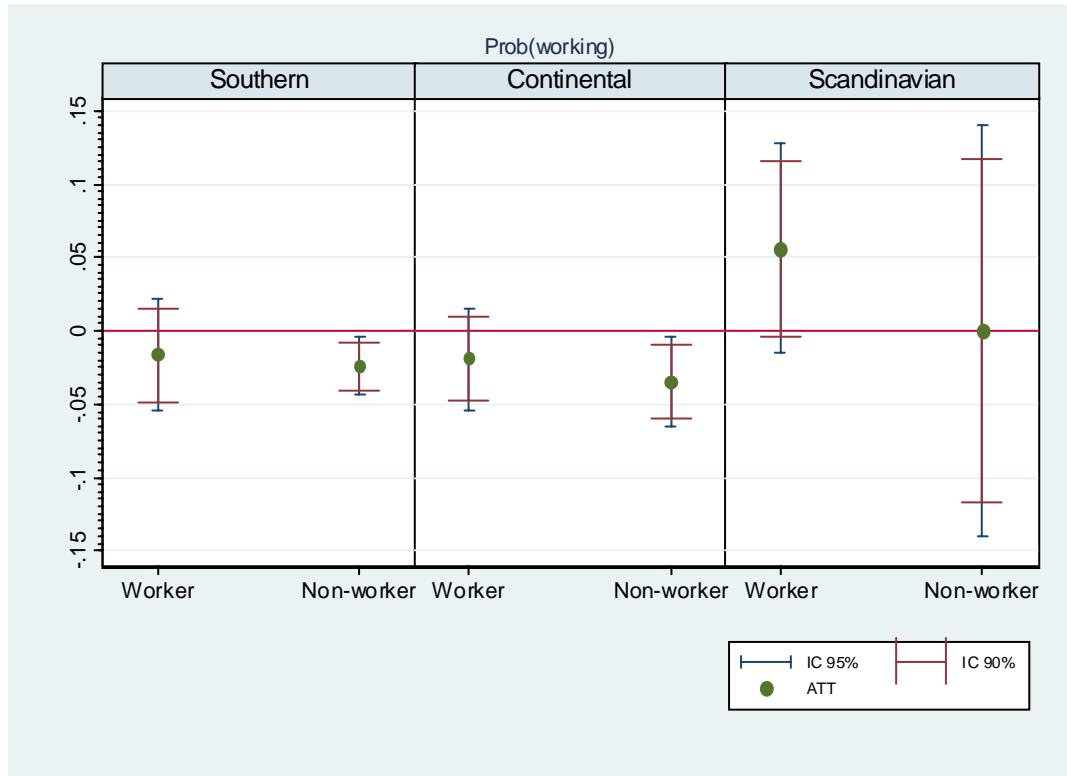
Figure 5. Average treatment effect on the treated on Household Total Equivalent Income. Treatment caregiving
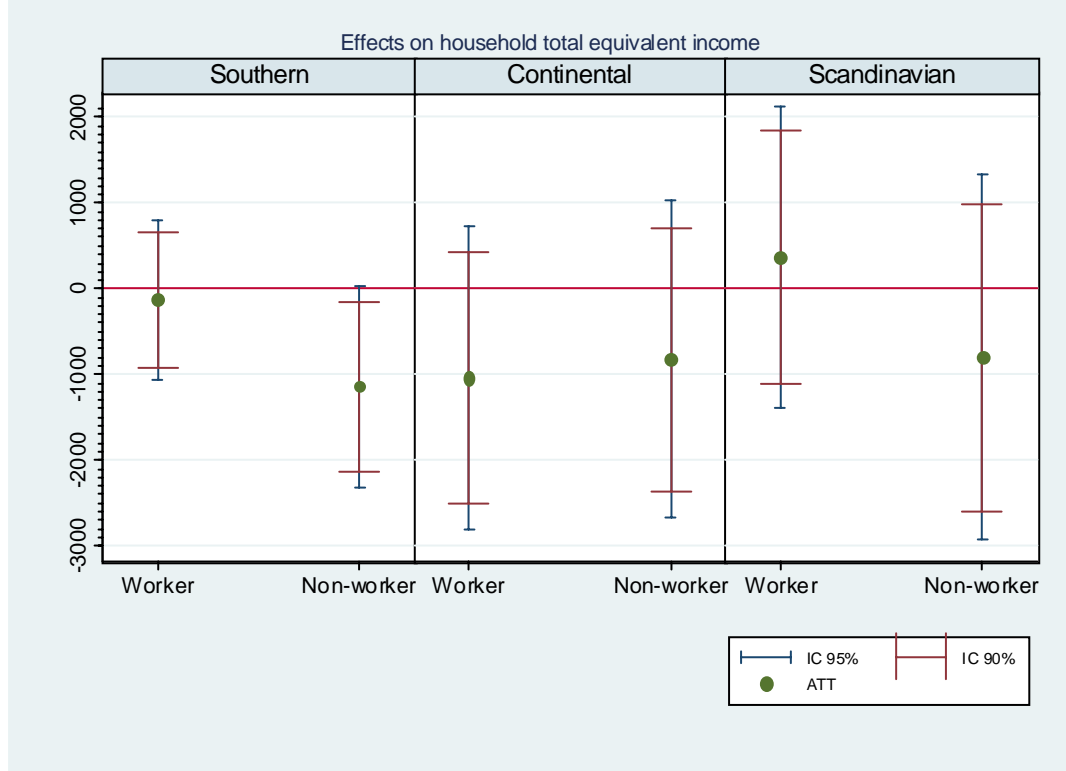

Figure 6. Average treatment effect on the treated on Household Total Labour Equivalent Income. Treatment caregiving

Figure 7. Average treatment effect on the treated on Household Total Social Transfers Equivalent Income. Treatment caregiving

Figure 8. Average treatment effect on the treated on Prob (Employment). Treatment caregiving at home

Figure 9. Average treatment effect on the treated on Household Total Equivalent Income. Treatment caregiving at home

Figure 10. Average treatment effect on the treated on Household Total Labour Equivalent Income. Treatment caregiving at home.
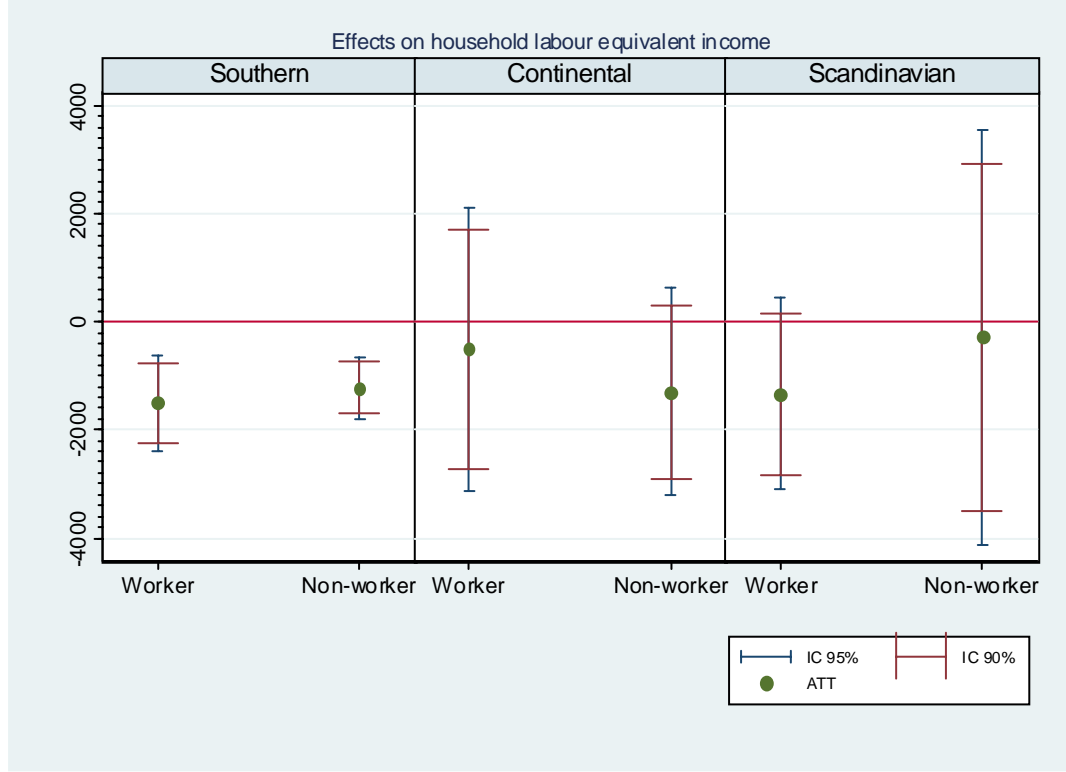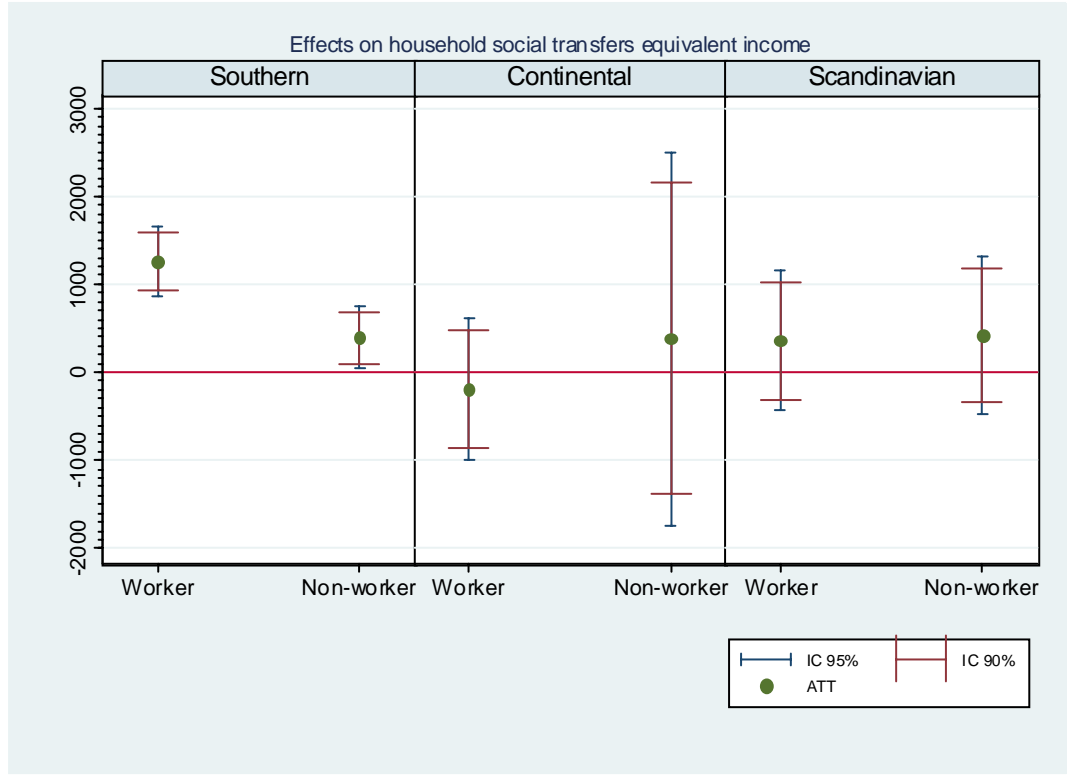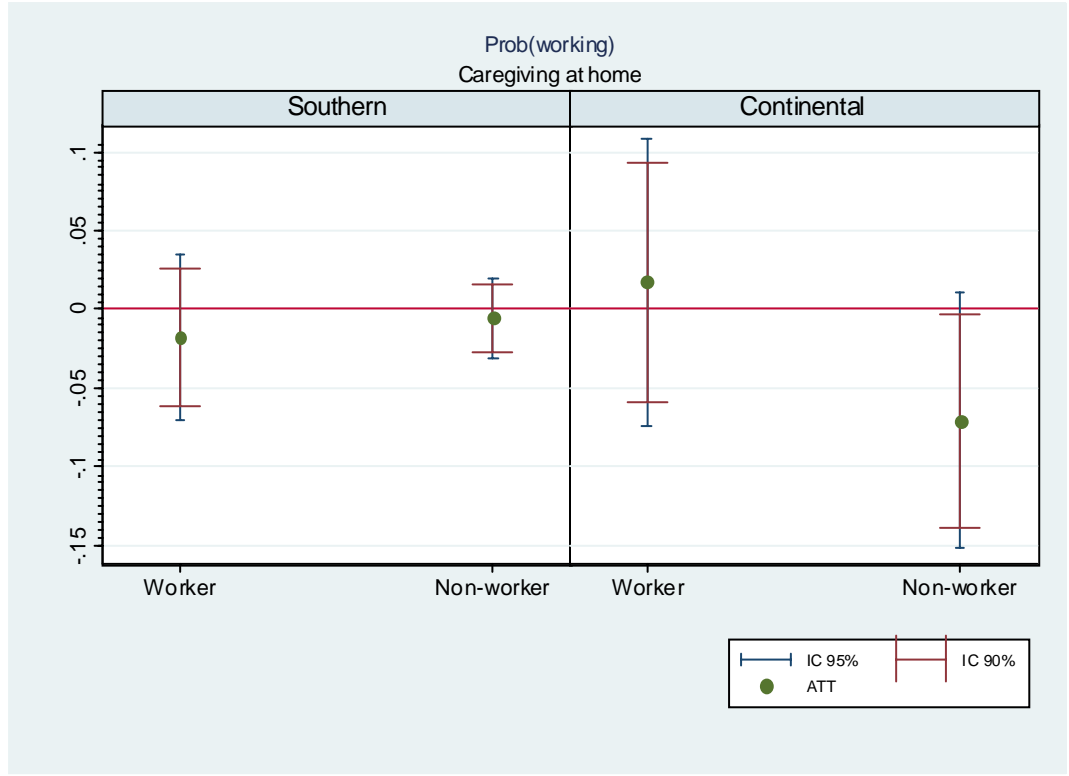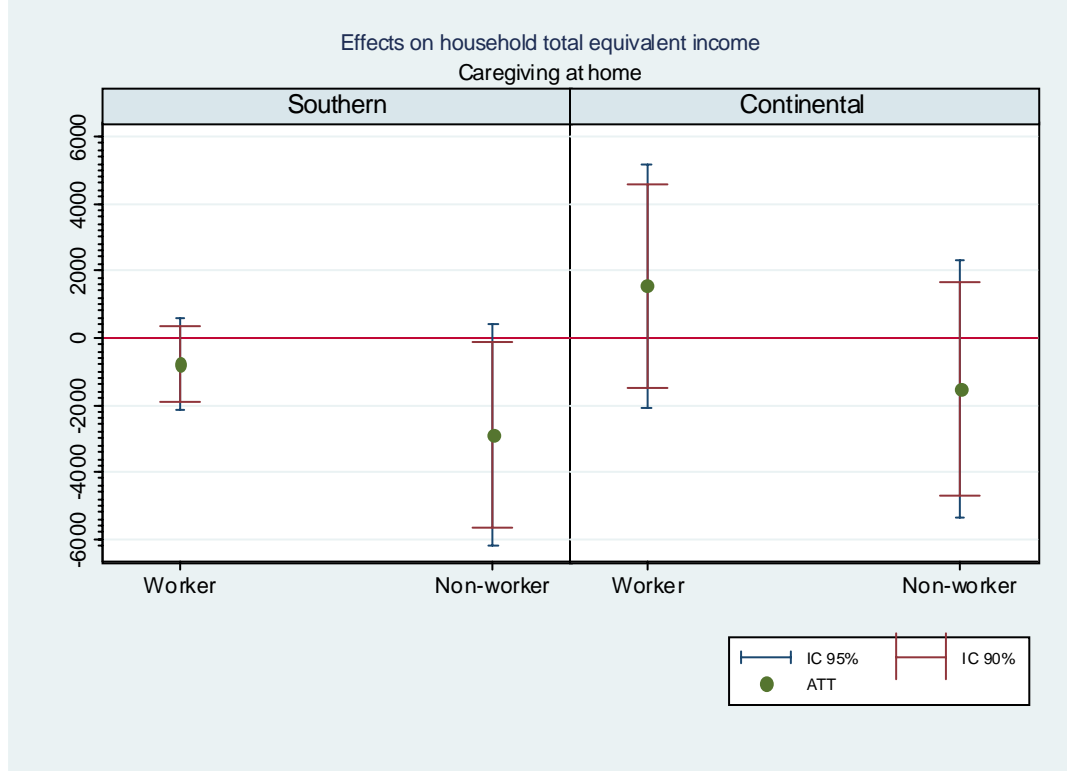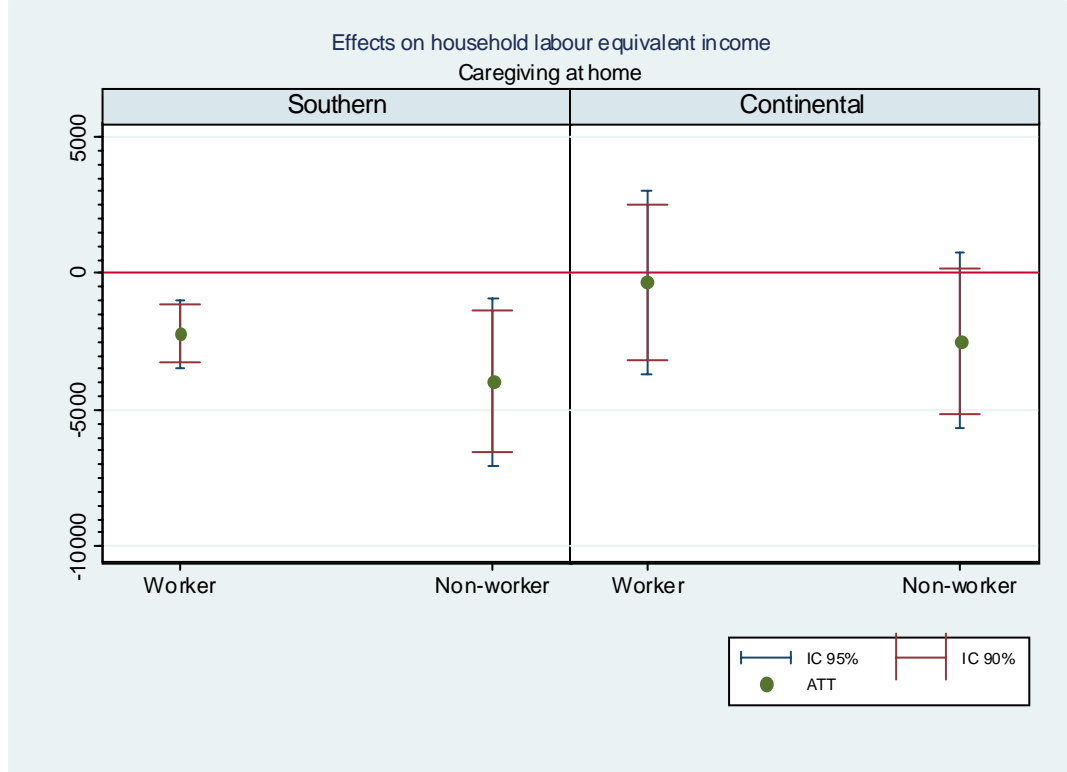
Figure 11. Average treatment effect on the treated on Household Total Equivalent Social Security Transfers. Treatment caregiving at home
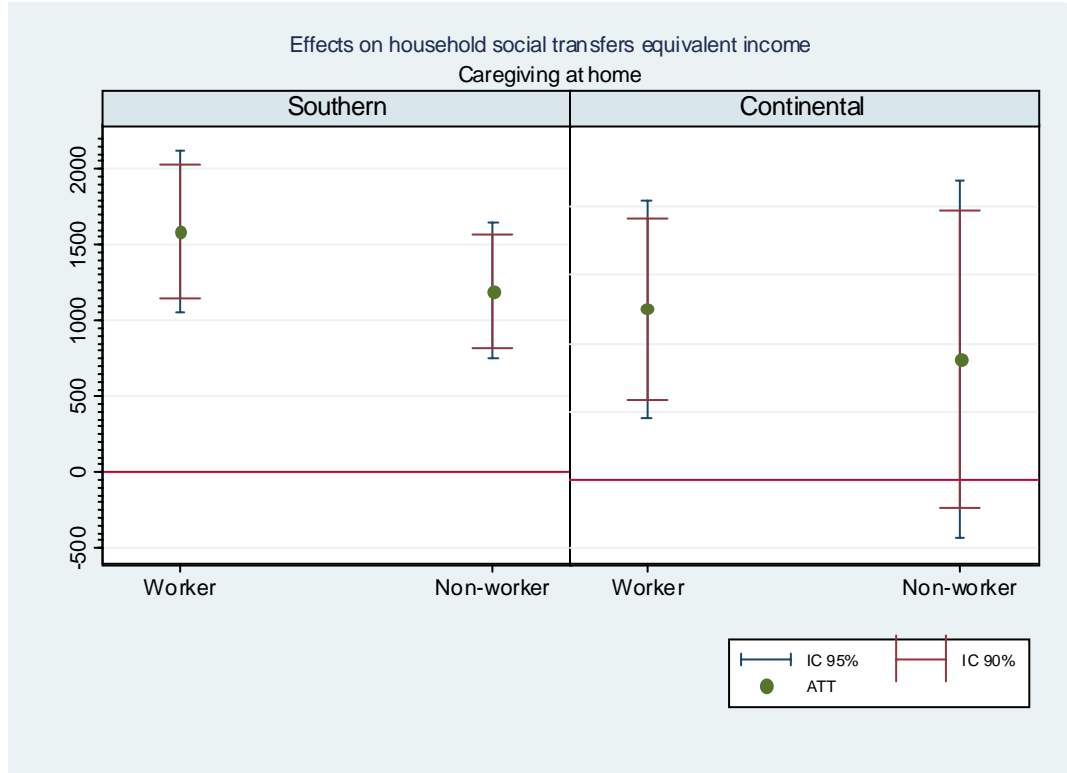
Table 1. Control and treatment samples: number of observations.

	Southern+Ireland		Continental		Scandinavian	
	Caregiving	Caregiving home	Caregiving	Caregiving home	Caregiving	Caregiving home
	119405		90455		22934	
	30755		26712		9505	
Women 30-60	481	261	295	64	139	17
Work t-2 and t-1	426	228	262	57	125	-
Treated	86	31	76	9	62	-
Treated (no missing propensity score)	134	54	129	31	47	-
Higher education	206	143	57	17	16	-
Sec. education	81	45	40	12	17	-
Lower education	195	100	128	26	48	-
Age 30-39	150	83	94	19	60	-
Age 40-49	23062		21613		7436	
Age 50-60	20974		18770		6738	-
Control	5864		5993		3756	-
Control (no missing propensity score)	6395		8498		2218	-
Higher education	8715		4279		764	-
Sec. education	8137		7138		2101	-
Lower education	8046		7545		2672	-
Age 30-39	4791		4087		1965	-
Age 40-49	36602		19011		1969	
Age 50-60	788	381	351	73	41	11
No Work t-2 and t-1	784	379	347	71	41	-
Treated	41	21	45	4	7	-
Treated (no missing propensity score)	179	63	164	29	20	-
Higher education	564	295	138	38	14	-
Sec. education	104	49	42	10	5	-
Lower education	301	132	129	27	4	-
Age 30-39	379	198	176	34	32	-
Age 40-49	24063		13214		1409	
Age 50-60	23713		12978		1070	-
Control	1934		1617		306	-
Control (no missing propensity score)	5668		5922		394	-
Higher education	16111		5439		370	-
Sec. education	6822		3887		215	-
Lower education	7279		3964		255	-
Age 30-39	9612		5127		600	-

Table 2. Percentage of women working and (mean age)

		Southern		Continental		Scandinavian	
		Caregiving	Caregiving home	Caregiving	Caregiving home	Caregiving	Caregiving home
		Work t-2 and t-1					
Treated		90.23	88.12	93.56	95.31	94.96	100.00
		(46.4)	(46.5)	(46.8)	(46.1)	(48.5)	(50.9)
Control		93.63	93.63	94.43	94.43	95.68	95.68
		(43.2)	(43.2)	(43.0)	(43.0)	(44.6)	(44.6)
		No work t-2 and t-1					
Treated		2.79	2.89	2.87	2.74	9.76	18.18
		(48.5)	(49.1)	(48.9)	(48.5)	(52.4)	(50.7)
Control		6.40	6.40	7.99	7.99	19.87	19.87
		(46.3)	(46.3)	(46.1)	(46.1)	(47.7)	(47.7)

Table 3. Treatment caregiving. Subsample of workers

	Southern+Ireland		Continental		Scandinavian	
	M1	M4	M1	M4	M1	M4
Labour Behaviour						
Employed	-0,016	-0,017	-0,019	-0,007	0,056[ii]	0,006
Full time	-0,034	-0,028	-0,013	-0,034	0,000	0,002
Household income (€ PPP, equiv.)						
Total (annual)	-131,881	-486,702	-1037,429	-1128,005	369,313	-248,171
Labour	**-1500,406**	**-1592,390**	-1331,097	*-1232,395*	-508,802	-898,936
Private transfers	-3,878	4,898	43,518	91,370	321,515	*322,983*
Social transfers	**1263,103**	**1137,715**	-193,632	-365,433	361,293	397,147
Unemployment benefits	2,427	-9,094	-92,282	*-191,346*[i]	-35,278	-75,615
Old-age benefits	**1059,667**	**936,630**	252,036	-191,550	6,367	90,066
Family-related allowances	-24,117	-17,024	-19,943	15,327	-139,901	-46,304
Social assistance	5,892	3,172	11,811	8,054	9,559	2,203
Sickness benefits	**179,963**	**193,558**	-326,875	16,260	*476,984*[i]	**451,167**
Personal income (€ PPP)						
Total (annual)	107,659	-178,579	-1341,692	-1101,459	1186,813	1000,678
Labour income	85,535	-223,902	*-1460,818*	-1025,958	587,293	354,527
Social transfers	-73,483	-4,643	-249,756	-295,760	105,068	197,250

Note: Values significantly different from zero: at P<0.05 in bold typeface; in italics at P<0.10
  i. Significantly different from zero at 5% when robust standard errors are used
  ii. Significantly different from zero at 10% when robust standard errors are used

Table 4. Treatment caregiving. Subsample of non-workers

	Southern+Ireland		Continental		Scandinavian	
	M1	M4	M1	M4	M1	M4
Labour Behaviour						
Employed	**-0,024**	**-0,023**	**-0,035**	**-0,033**	0,000	-0,043
Full time	0,045	0,000	0,000	0,028	0,250	*0,375[ii]*
Household income (€ PPP, equiv.)						
Total (annual)	*-1140,956[iii]*	-1283,206[i]	-822,548	-897,249[ii]	-796,310	-1349,520
Labour	**-1231,407**	**-1711,990**	-1299,003[ii]	*-1140,927[i]*	-288,973	-828,747
Private transfers	**37,306**	12,697	-3,303	7,766	-33,697	-29,580
Social transfers	**389,760**	**432,977**	417,490	413,367	381,820	513,243
Unemployment benefits	-16,311	-46,116	-7,930	38,518	654,792[ii]	431,009
Old-age benefits	*289,351*	**396,728**	169,864	67,346	844,663	886,827
Family-related allowances	22,578	-0,648	57,246	73,873	-128,192	*-223,981[i]*
Social assistance	13,417	**13,235[ii]**	-6,144	0,635	-36,147	-126,360[ii]
Sickness benefits	*94,377*	*85,907*	245,072	265,559	-751,816	-385,390
Personal income (€ PPP)						
Total (annual)	-514,201[i]	*-342,298[i]*	*-797,108*	**-803,856**	-472,744	-477,546
Labour income	**-203,208**	**-156,869**	**-629,282**	**-432,380**	-34,884	-254,227
Social transfers	-173,862	*-198,642*	-129,241	-175,329	-552,086	-219,639

Note: Values significantly different from zero: at P<0.05 in bold typeface; in italics at P<0.10

     i. Significantly different from zero at 5% when robust standard errors are used

     ii. Significantly different from zero at 10% when robust standard errors are used

     iii. It is not significantly different from zero when robust standard errors are used

Table 5. Treatment home caregiving. Subsample of workers

	Southern+Ireland		Continental	
	M1	M4	M1	M4
Labour Behaviour				
Employed	-0,018	-0,034	0,018	0,009
Full-time	-0,040	-0,029	**0,170**	0,033
Household income (€ PPP, equiv.)				
Total (annual)	-780,812	*1048,775*	1552,609	922,264
Labour	**-2220,465**	**-2443,292**	-335,175	-600,285
Private transfers	5,733	5,698	284,855	267,558
Social transfers	**1585,076**	**1578,137**	**1254,404**	*811,225[i]*
Unemployment benefits	**-109,303[ii]**	-59,205 [ii]	-109,742	-78,646
Old-age benefits	**1328,410**	**1330,129**	**1300,136**	**1001,014**
Family-related allowances	18,057	-11,370	-75,093	-138,174
Social assistance	3,042	0,646	21,884	55,316
Sickness benefits	**285,325**	**278,293**	112,895	-34,024
Personal income (€ PPP)				
Total (annual)	-242,462	-915,164	124,926	-1150,813
Labour income	-284,628	-930,827[ii]	500,823	-568,293
Social transfers	-1,819	-4,780	-98,195	-341,421

Note: Values significantly different from zero: at P<0.05 in bold typeface; in italics at P<0.10
   i. Significantly different from zero at 5% when robust standard errors are used
   ii. Significantly different from zero at 10% when robust standard errors are used
   iii. It is not significantly different from zero when robust standard errors are used

Table 6. Treatment home caregiving. Subsample of non-workers

	Southern+Ireland		Continental	
	M1	M4	M1	M4
Labour Behaviour				
Employed	-0,005	-0,013	*-0,070[i]*	0,042
Household income (€ PPP, equiv.)				
Total (annual)	*-2905,182[i]*	**-1553,359[iii]**	-1520,561	-746,061
Labour	**-3968,822**	**-2704,984**	-2470,875[ii]	*-2116,674*
Private transfers	0,991	-4,222	60,117	53,479
Social transfers	**1196,594**	**1216,627**	885,546	684,403
Unemployment benefits	-17,035	-10,434	-12,624	129,115
Old-age benefits	**961,433**	**960,391**	-145,002	-233,710
Family-related allowances	*-52,474*	-22,172	211,016	142,183
Social assistance	12,020	8,388	98,918	23,020
Sickness benefits	**329,818**	**301,319**	762,251[ii]	619,888
Personal income (€ PPP)				
Total (annual)	*-496,782*	-309,609	-346,261	-196,504
Labour income	-64,398	-92,039	**-900,675**	**-687,371**
Social transfers	-313,283	-183,805	574,193	452,968

Note: Values significantly different from zero: at P<0.05 in bold typeface; in italics at P<0.10

    i. Significantly different from zero at 5% when robust standard errors are used
    ii. Significantly different from zero at 10% when robust standard errors are used
    iii. It is not significantly different from zero when robust standard errors are used