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WOMEN PARTICIPATION AND CARING DECISIONS: DO DIFFERENT INSTITUTIONAL FRAMEWORKS MATTER? A COMPARISON BETWEEN ITALY AND THE NETHERLANDS

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Women participation and caring decisions: do different institutional frameworks matter? A comparison between Italy and The Netherlands*

Abstract

From a classic static model of time allocation with altruism, testable implications relative to the effects of the differences in policy intervention on informal care and participation are derived. These are then tested by comparing working and informal caring choices in Italy and The Netherlands, two countries that differ deeply in the policy interventions towards adults in need and in the accessibility to part-time working positions. The analysis is conducted by comparing the estimated coefficients of a multivariate dynamic binary probit on informal care provision and participation on a panel sample of working age married women of the two countries. As predicted by the model, results reveal for The Netherlands with respect to Italy a lower negative causal effect of informal care on labour market participation, a lower state dependence in informal caring decisions and a non significant role of income levels in determining caring choices.

JEL Classification: D13, J22, I18

Keywords: labour market participation, informal care-giving, welfare policies, multivariate binary probit

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1 Introduction

The Long Term Care (LTC)[1] is one of the challenges posed by population ageing. In developed countries, the number of elderly people is growing and the share of elderly with severe disabilities seems also to be growing along with life expectancy (Robine *et al.* 2002)[2] .

The LTC can either be provided formally (by the State or by the market) or informally (by the family). The informal provision of care towards the elderly was in the past the far most widespread method of help. The reduction of the family size and of the familiar networks are however compromising the adoption of such a solution. Care responsibilities are often uniquely in charge of the spouse or of the daughter and constitute a very high burden also from the psychological point of view. On the opposite perspective, informal care-giving still appears to be the favorite solution of assisted individuals (Lundsgaard 2005).

Informal care and work are potentially competing demand of time. European Union countries are now promoting an increase in female participation and the growth in the rates of participation of females in the labour market is expected to influence care activity rates. *Vice versa* caring responsibilities are expected to encumber participation.

Whether it is better to promote informal care-giving, provide direct public help, or provide incentives for insurance is debatable. Whatever the policy solution countries decide to undertake, exploring the mechanisms that link work and care and how those are affected by different policies seems promising. In particular, it is important to understand whether informal care-giving reduces women's labour market participation and *vice versa*, and how effective policies aiming at reducing this trade-off are.

In the literature, informal caring and working have been studied mainly as exogenous or predetermined decisions one with respect to the other (Spiess and Schneider 2002, Carmichael and

[1] LTC is identified as the provision of non medical care to adults in need because impaired in some activities of daily living (ADL) or instrumental activities of daily living (IADL).

[2] However, not all the studies agree in stating such a tendency (Cutler 2001).

Charles 1998 and 2003, Viitanen 2005, Crespo 2007). The focus furthermore has been mainly on the effects of informal care on work. A rigorous approach, however, must treat caring and working decisions as simultaneously determined, as done for example in Heitmueller and Michaud (2006). Furthermore it would also be interesting to understand what role is played in the decisional process by the institutions. As far as I know, there is only one work that looks at the role of institutions and it only focuses on how the availability of publicly supplied formal care influences the informal care provision rates of a country (Viitanen 2007).

This paper adds to the literature on the topic in that it analyses how institutions influence the simultaneous and dynamic relationships between informal care and labour market activity. The focus is on married women because they have a traditionally high involvement in caring activities and a relatively more elastic labour supply compared to both men and single women[3] .

In a classic static model of time allocation with altruism, testable implications relative to the effects of the differences in policy intervention on informal care and participation are derived. Those are then tested by comparing working and informal caring choices in Italy and The Netherlands, two countries that differ deeply in the policy interventions towards the elderly and disabled and in the accessibility to part-time working positions.

In Italy, public provision of services for the elderly and disabled is minimal and families have to cover a substantial part of non medical care needs. In addition, the access to part-time working positions is difficult.

In The Netherlands, coverage of non medical care needs is provided by a specific insurance plan and part-time jobs are quite widespread.

The analysis is based on the European Community Household Panel (ECHP) data. Working and caring decisions are estimated jointly by a multivariate dynamic binary probit following Heitmueller and Michaud (2006)'s approach. The estimation technique fully accounts for the si-

[3] According to Blundell and MaCurdy (1999) review on the literature on the topic, intertemporal labour supply elasticity for married women places itself in the 0.5-1 range. For critical survey of empirical findings see also Berndt (1990) section 11.3B.3.

multaneity in the two decisions, allowing some crucial questions to be answered as to whether individuals quit work in order to care for someone in need or if, instead, only individuals who are not on the labour market engage in caring activity, and *vice versa*.

Throughout an exercise of simulation I am able to show the effects of the adoption in Italy of the Dutch policy and the effects in The Netherlands of the adoption of the Italian one.

The paper is organized as follows. A synthetic review of the literature is presented in section 4.2. Section 4.3 describes the theoretical framework. Section 4.4 introduces the econometric specification used. Section 4.5 illustrates the institutional framework for the assistance to ill/disabled in the two countries. Section 4.6 presents the data used in the empirical analysis and shows some descriptive statistics. Results and conclusions are reported in section 4.7 and 4.8.

2 Review of the literature

Intra-household insurance for illness and disability and its effects on labour market participation of potential carers have not been studied much in Europe, but literature on the topic is now growing.

The evidence related to the effect of informal care on work is contrasting. Some studies do not detect any effect of care and work. It is the case of Wolf and Soldo (1994) for the United States (US), of Viitanen (2005) for European countries[4] and of Schneider and Wolf (2000) for Germany. Some others find a negative correlation between care and work. The evidence is however often limited to specific cases. Carmichael and Charles (1998) in relation to the United Kingdom (UK), find that care prevents people from working if it is intensive, i.e. if the effort exceeds 20 hours per week. In other studies, the negative effect is detected only when the dependent individual is living within the household, as in Ettner (1995) for the US, in Heitmueller and Michaud (2006) for the UK and in Casado *et al.* (2007) for Spain. However, Ettner (1996) on a different sample of American households also finds the opposite result: care negatively affects work especially when care-giving is directed towards parents or relatives living outside the household.

[4] Namely: Austria, Belgium, Denmark, France, Finland, Greece, Ireland, Italy, The Netherlands, Portugal, Spain and United Kingdom.

The dimension of the effect is highly variable. Just to give some examples, Crespo (2007) finds for European middle aged women that the reduction in participation due to care-giving activity is about 35 per cent in the Northern countries and 32 per cent in the Southern countries. Heitmueller and Michaud, on the other hand, find for the UK that care-givers living with the ill/disabled individual have a probability only 5.9 percentage points (pp.) lower of being employed the following year. Finally, by adopting an intensive margin perspective, Johnson and Lo Sasso (2000) find that American women aged 53-65 who devote an average of two or more hours per week helping their parents work about 43 per cent less time than women overall in the same age interval.

Differences in findings are substantially driven by methodological issues. A negative relationship between care and labour has been proved to emerge more easily when endogeneity is not accounted for (Crespo 2007 is an exception). The choice of instruments, however, is normally highly constrained by the availability of the necessary information and by the theoretical framework adopted to derive the equations to be estimated.

Results are also likely to be sensitive to sample definition. When data are available, in order to get a better picture of the carer situation, it is appropriate to isolate women at risk of being a carer, as for example women whose parents are alive and in bad health. This is done by Wolf and Soldo (1994) and Crespo (2007) for example, but many other studies do not have the necessary information on parents.

Intensity of care is another key determinant especially when the study is focused on the intensive margin (i.e. hours of work and care) rather then on the extensive one (i.e. participation and caring decision). It is however not easy to measure, if not merely in terms of hours of care per week and, even in that form, not all the data-set provide such an information. The intensity of care is furthermore strictly linked to the provision of help from other family members (Börsch-Supan *et al.* 1992).

Finally, results depend on the availability of substitutes to informal care, as for example formal

care publicly or privately provided and/or financed. Viitanen (2007) shows that public provision of home help services for the elderly significantly reduces the supply of informal care-giving outside the households by 45-49 year old women (both in intensive and extensive margin). However, it does not affect care-giving within the household.

The reverse causality can be a further problem. The negative effect of care on work can be due to the causal effect of work on care, instead that of care on work. Such a problem can be excluded only by estimating the two equations of care and work simultaneously as done, for example, in Schneider and Wolf (2000) and in Heitmueller and Michaud (2006).

The effect of work on informal care has been studied less[5] . The two available works, both focused on the UK, find that working activity reduces care, see Heitmueller and Michaud (2006) and Heitmueller (2007). The reduction is however small (even smaller than the effect of care on work). For example, according to Heitmueller and Michaud (2006), employment status reduces the probability of providing care by about -0.78 pp. for co-residential carers and of -1.1 pp. for extra-residential ones.

3 Theoretical framework

3.1 A model of optimal time allocation

Let us outline, in a static framework, the time allocation and consumption problem of an altruistic individual, a married woman, member of a household that includes among the others an elderly parent who is ill or disabled. His or her illness/disability generates a need for care and his or her well-being depends on the amount of care received.

The label "care" groups services and activities of heterogeneous nature. In particular, let us consider that "basic" services required for decent survival, as cleaning, dressing, feeding etc..., can be indifferently supplied informally (x_H), i.e. directly by the woman, or formally (x_F), i.e. bought

[5] The effect of work on care may be different from the effect of care on work because the group of individuals that one observes transiting from work to care may have different characteristics with respect to the one that is observed transiting from care to work.

in the market or provided by the welfare system. For what concerns such "basic care", formal and informal care are considered perfect substitutes. In the model, a sort of household production function (f) transforms the hours addressed to informal provision of care in care.

There are however some "extra" needs, as the psychological support, that can be satisfied only by the woman herself, even jointly with the provision of "basic care". With respect to the formal care, informal care then generates an "extra" utility for the cared person and consequently also for the altruistic care giver (a sort of psychic income as in Gronau 1986). I account for it by inserting the hours of informal care directly in the utility function.

The woman's utility function in this context depends on the household aggregate consumption (C), on her own leisure (L), on care (formally and/or informally) provided to the ill/disabled individual (x) and on the hours of informal care supplied care (H). It is assumed to increase as consumption, leisure, care and hours of informal provision of care increase, but with diminishing marginal returns. More specifically, it is plausible that care (both formal and informal) behaves as a sort of "necessary" good and, as income increases, after "basic care" needs have been satisfied and a certain level of "extra care" provision is reached, the quantity demanded remains constant. Leisure, instead, usually behaves as a normal good: the higher the income, the more the individual buys it by substituting formal care with informal care. The woman is supposed to act in order to maximize her utility under the usual household resource constraints, taking working decisions of other households members as exogenously determined.

In order to model this, I refer to the literature on the household production function introduced by Gronau (1973, 1986). For sake of simplicity the analysis refers to a partial equilibrium environment, where wages are considered exogenous.

The optimal time allocation between informal care and work can be derived by solving the following maximization problem:

$$\max_{C,x,L,H} U = \max U(C, x, L, H) \tag{1}$$

Under the following constraints:

$$x_{_F} + x_H = x \tag{2}$$

$$f(H) = x_H \tag{3}$$

$$N + L + H \leq T \tag{4}$$

$$p_{_F} x_{_F} + p_C C \leq wN + Y \tag{5}$$

where: C is the household consumption; x is the amount of care provided, formally or informally, to the ill/disabled member; $x_{_H}$ is the amount of informal care; $x_{_F}$ is the formal care bought in the market; $f(...)$ is the home production function of care that is assumed to have positive, but decreasing marginal returns ($f' > 0$ and $f'' < 0$, where f' is the first derivative, f'' is the second derivative); L is the time devoted by the woman to leisure; H is the time devoted by the woman to home producing care; T is the total endowment of time; N is the number of hours of market work supplied by the woman; w is the hourly wage; Y is the total labour and non labour income of the household, woman's earnings excluded; p_F is the price of formal care; p_C is the price of consumption, for simplicity from now on normalized to one.

The first order conditions for this problem[6] are:

$$U_C = \lambda \tag{6}$$

$$U_x = \lambda p_F \tag{7}$$

$$U_L = \lambda w \tag{8}$$

$$U_H + U_x f'(H) - \lambda w = 0 \tag{9}$$

First derivatives are indicated by subscripts (e.g. U_L is the first order derivative with respect to leisure) and λ is the Lagrange multiplier for the budget constraint. From equations 6, 7 and 9

[6] Those optimum conditions are obtained by maximizing the following Lagrangian:
$\max_{C,x,L,H} \mathcal{L} = \max U(C, x, L, H) + \lambda(w(T - L - H) + Y - p_{_F} x_{_F} - p_C C)$
with respect to household consumption (C), formal and informal care provision (x), woman's hours of leisure (L) and hours of informal care supplied by the woman (H).

I obtain:

$$p_{_F} f'(H) = w - \frac{U_H}{U_C}, \tag{10}$$

meaning that, at the margin, the product between the price of formal care and the marginal product of the hours of informal care provided ($p_{_F} f'(H)$) must balance the hourly market wage (w) minus the ratio between the marginal utility of home producing care (U_H) and the marginal utility of consumption (U_C).

The reservation wage for the last hour of care is then:

$$w_{care} = p_{_F} f'(H) + \frac{U_H}{U_C}. \tag{11}$$

In addition, from equations 6 and 8 I have:

$$w = \frac{U_L}{U_C}. \tag{12}$$

At the optimum, the ratio between the marginal utility of leisure (U_L) and the marginal utility of consumption (U_C) must also be equal to the market wage rate.

The equation 12 can be seen as the reservation wage for the last hour of leisure:

$$w_{leisure} = \frac{U_L}{U_C}. \tag{13}$$

The optimal time allocation in this setting comes from the comparison between the hourly market wage (w), the reservation wage for providing informal care (w_{care}, see eq. 11) and the reservation wage of leisure ($\mathrm{w}_{leisure}$, see eq. 13).

In this model, caring and labour market participation decisions are simultaneously determined and differ across potential care-givers according to their preferences and their market wages. In comparison with the ante shock situation in which no care duties had to be accomplished, for each hour of the time endowment, if the substitution effect dominates, *ceteris paribus*:

- the higher the price of formal care, the higher the probability of substituting one hour of

work and/or of leisure with one hour of informal care (and the lower the probability of substituting an hour of care with one hour of work);

- the higher the marginal productivity in producing informal care, the higher the probability of substituting one hour of work and/or of leisure with one hour of informal care (and the lower the probability of substituting an hour of informal care with one hour of work)[7] ;

- the higher the marginal utility of home producing care, the higher the probability of substituting one hour of work and/or of leisure with one hour of informal care (and the lower the probability of substituting an hour of informal care with one hour of work);

- the higher the marginal utility of consumption, the lower the probability of substituting one hour of work and/or of leisure with one hour of informal care (and the higher the probability of substituting an hour of informal care with one hour of work);

- the higher the market wage, the higher the probability of working instead of providing informal care or having leisure.

The effect of the health shock affecting the parent on each woman's work supply is in principle undetermined. However, once the elderly parent gets sick, the reservation wage of the woman for each hour of work changes and is presumably higher than before the shock. In particular, if it results for some hours to be greater than the hourly wage she has in the actual work, the substitution effect will induce her to reduce her hours of work (intensive margin). This can eventually result in quitting her job completely (extensive margin). If, on the other hand, she is not initially working, the fact that a health shock strikes the parent reduces the probability that she will enter the labour market as well as it probably reduces her amount of leisure.

[7] If technology (k) is such that it increases the product for each hour of work acting as a multiplicative factor ($f(H)=k\cdot g(H)$), a better technology always leads to address more time to production. This is, however, not always the case if the technology is resource saving (i.e. $f(H)=g(k\cdot H)$), see Gronau (1986).

3.2 The role of institutions

In the model described, the role of institutions emerges indirectly. Let us consider three policy options: the complete coverage of the "basic" care expenses, an incentive system towards informal care-giving and an easier access to part-time jobs.

If coverage of the care expenses for the satisfaction of "basic care" needs is complete, the "perceived" price of formal care is almost zero (see eq. 5 and 11 with $p_{_F}$=0). This induces to satisfy the "basic care" needs of the individual more through formal care than through informal care and determines a sort of income effect: for the same level of care provided, families have more resources to buy leisure and goods. Three testable implications can be derived:

- given that the reservation wage for substituting an hour of informal care with one hour of work (and *vice versa*) is lower than in the absence of such a coverage, I expect a lower negative causal relation between care and work (because I expect fewer people to care, more people to care less and fewer people to substitute work with care);
- in addition, a "perceived" price of formal care almost equal to zero leads to a lower dependency of informal care provision on the marginal productivity in producing it ($f'(H)$);
- finally, I expect the hours of informal care provided to be mainly addressed to the satisfaction of "extra" needs for which there are no substitutes available in the market and then, if the marginal utility of care addressed to the ill /disabled member is positive, but decreases fast as the quantity of care provided increases, I expect a lower effect of income in explaining informal care provision.

On the other hand, incentives towards informal care provisions that link the transfer amount to the effective provision of care potentially leads to a higher negative (causal) effect of care-giving on work and/or leisure (the right side of equation 11 increases of an additional term). The individual, in presence of incentives, can more easily substitute work and/or leisure with care.

Finally, an easier access to part-time jobs is also expected to reduce the negative causal effect of care on work and of work on care leaving to the individual more freedom in choosing the optimal combination of hours of work and hours of care to provide. Typically, in fact, at least for what concerns work, individuals are not free of choosing exactly the desired number of hours to supply, but they can opt only for full-time or part-time positions.

3.3 The empirical model

In order to test the model implications sketched in the previous paragraph, I estimate caring and working decisions in two countries that adopt opposite policies towards long term care and I compare the estimates obtained.

In doing that I will focus on the extensive margin by assuming that if the woman works, she works at least 20 hours or she doesn't work at all. Working is then modelled as a discrete choice that depends on the comparison between the utility derived from working at least part-time or not working at all. Analogously, I will concentrate on the extensive margin also for what concerns informal care provision. The individual is then called to choose among four possible alternatives: work and care, work and not care, care and not work, not care and not work[8] .

I furthermore allow for state dependence in working and informal caring choices. As time goes by, the carer is likely to improve her productivity and ability in caring, a feature that creates state dependence if the price of formal care is not zero. Other explanations of state dependence are also possible. Individuals are likely to form habits and might dislike changes in their daily activities. Alternatively, state dependence in caring can be thought to derive from a sort of psychological dependency of the carers towards the cared person. Once activities are undertaken, it is difficult to withdraw as this would appear as desertion.

As for labour activity, I suppose again that the individual tends to prefer not to change her daily habits and to enjoy more work if she was previously working (Hotz *et al.* 1988). In the

[8] The implementation of a study on the intensive margin is left for future research.

literature, other explanations for state dependence are produced: human capital accumulation (Heckman 1981a) and search costs (Eckstein and Wolpin 1990, Hyslop 1999). Those are often modelled as factors that respectively increase or reduce market wages.

For each of the N individuals of the balanced panel, the decision to work (W) and to care informally (IC) can be formalized, for each t in the time interval [0,T], in terms of latent variables under a random utility framework (Heitmueller and Michaud 2006):

$$N_t^* = x_t\alpha^* + W_{t-1}\gamma_{11}^* + IC_{t-1}\gamma_{12}^* + H_t^*\gamma_{13}^* + v_{1t} \quad (14)$$

$$H_t^* = x_t\beta^* + IC_{t-1}\gamma_{21}^* + W_{t-1}\gamma_{22}^* + N_t^*\gamma_{23}^* + v_{2t} \quad (15)$$

with:

W_t=*1 if* $N_t^* > 0$; $W_t = 0$ otherwise

IC_t=*1 if* $H_t^* > 0$; $IC_t = 0$ otherwise

where subscripts referred to individuals are omitted to simplify the notation and: N_t^* is the "desired" number of hours of work at time t; H_t^* is the "desired" number of hours of informal care at time t; x is the vector of the explanatory variables, including the constant; W_{t-1} is the lagged value of the dummy for labour market participation; IC_{t-1} is the lagged value of the dummy for informal caring activity; $\alpha^{*\prime}s$, $\beta^{*\prime}s$ and $\gamma^{*\prime}s$ are the parameters to be estimated; v_{jt} (j=1,2) includes all the time variant unobserved determinants of the choice. The error terms (v_{1t} and v_{2t}) are supposed to be independent across equations.

In particular, γ_{13}^* gives the causal effect of hours of work on hours of care and γ_{23}^* gives the causal effect of hours of care on hours of work. The vector of explanatory variables includes: taste shifters, characteristics proxying labour market performances and non labour income (that includes husband's labour income, considered as exogenous)[9] . The time variant unobserved

[9] The market wage does not directly enter the equations to be estimated as the solution of the system of first order conditions reasonably imply. Equations 14-15 have in fact to be considered as reduced forms of a system that includes also the market wage equation (that fixes a wage also for individuals that we do not observe working). In this way we lose the information on the direct effect of market wages in determining the choices, but we keep off the selection bias problems and the endogeneity problems that are raised when market wages are directly considered in the equations.

determinants of the choice are supposed to be independent across equations.

The reduced form for this model is given by:

$$N_t^* = x_t\alpha + W_{t-1}\gamma_{11} + IC_{t-1}\gamma_{12} + \overline{v}_{1t} \quad (16)$$

$$H_t^* = x_t\beta + W_{t-1}\gamma_{21} + IC_{t-1}\gamma_{22} + \overline{v}_{2t} \quad (17)$$

where:

$$\begin{aligned}
\alpha &= (\alpha^* + \gamma_{13}^*\beta^*)/(1-\gamma_{13}^*\gamma_{23}^*); \gamma_{11} = (\gamma_{11}^* + \gamma_{13}^*\gamma_{22}^*)/(1-\gamma_{13}^*\gamma_{23}^*);\\
\gamma_{12} &= (\gamma_{13}^*\gamma_{21}^* + \gamma_{12}^*)/(1-\gamma_{13}^*\gamma_{23}^*); \overline{v}_{1t} = (v_{1t} + \gamma_{13}^* v_{2t})/(1-\gamma_{13}^*\gamma_{23}^*);\\
\beta &= (\beta^* + \gamma_{23}^*\alpha^*)/(1-\gamma_{13}^*\gamma_{23}^*); \gamma_{21} = (\gamma_{22}^* + \gamma_{23}^*\gamma_{11}^*)/(1-\gamma_{13}^*\gamma_{23}^*);\\
\gamma_{22} &= (\gamma_{21}^* + \gamma_{23}^*\gamma_{12}^*)/(1-\gamma_{13}^*\gamma_{23}^*); \overline{v}_{2t} = (v_{2t} + \gamma_{23}^* v_{1t})/(1-\gamma_{13}^*\gamma_{23}^*).
\end{aligned}$$

Without imposing some restrictions on the values of the parameters (exclusion restrictions), the parameters of the structural system cannot be identified. In particular, contemporaneous causality effect can not be disentangled from the lagged causality effects (that are caught by γ_{12}^* in the equation for work and by γ_{22}^* in the equation for care). However, given the hypothesis of independence among time variant error terms of the structural equations, the correlation among the reduced form error terms already reveals the presence of causality. The covariance among $\overline{v}_{1t}$ and $\overline{v}_{2t}$ is in fact equal to:

$$Cov(\overline{v}_{1t}, \overline{v}_{2t}) = \frac{(\gamma_{13}^*\sigma_2^2 + \gamma_{23}^*\sigma_1^2)}{(1-\gamma_{13}^*\gamma_{23}^*)^2}$$

In case the covariance is negative, either γ_{13}^* or γ_{23}^* or both are negative.

The identification procedure proposed by Heitmueller and Michaud (2006) is based on the assumption that work does not depend on the lagged dummy for care and *vice versa*. That means that γ_{12}^* and γ_{22}^* are equal to zero and the causal responses can be recovered using:

$$\begin{aligned}
\gamma_{13}^* &= \gamma_{12}/\gamma_{22} \quad (18)\\
\gamma_{23}^* &= \gamma_{21}/\gamma_{11}
\end{aligned}$$

The test of non causality will be:

$\gamma_{12}/\gamma_{22} = 0$

$\gamma_{21}/\gamma_{11} = 0$

Not all the explanations of state dependence in participation and caring decisions are however compatible with such exclusion restrictions. Among the ones mentioned in the previous paragraph only habits can be alleged. If state dependence in working decisions derives from some reasons that affect wages, as for example human capital accumulation, restrictions are violated because wages influence both care and work[10] . The same is for state dependence in caring decisions. If it is due to a productivity increase, it influences both the decisions on care and on work.

4 The econometric specification

I estimate the dynamic supply of labour and care-giving by using the econometric specification and the estimation procedure used by Alessie *et al.* (2004). This procedure allows us to disentangle the "true" state dependence in the caring and working processes (i.e. the effects of the lagged dependent variables) from the unobserved heterogeneity effects and to check for causality, a result valuable *per se* but also necessary to correctly estimate the implications of the theoretical model mentioned in section 3.2. The model to be estimated is:

$$N_t^* = x_t\alpha + W_{t-1}\gamma_{11} + IC_{t-1}\gamma_{12} + c_1 + u_{1t} \quad (19)$$

$$H_t^* = x_t\beta + W_{t-1}\gamma_{21} + IC_{t-1}\gamma_{22} + c_2 + u_{2t} \quad (20)$$

[10] Following Wolf and Soldo (1994), in order to identify the causal effect of care on work, it can also be imposed that care depends on the severity of the impairment of the disabled, while work does not. This is like imposing α^*_{Health} (the coefficient of the instrument in the equation for work) equal to zero and the causal response can be derived as:

$$\gamma^*_{13} = \alpha_{Health}/\beta_{Health} = \gamma^*_{13} * \beta^*_{Health}/\beta^*_{Health}$$

where the star indicates the structural equation coefficients.

However, as instruments for the severity in impairment I can only use health and disability status of households members. Those variables only imperfectly measure the severity of the status of the individual cared for, for several reasons: I can not precisely identify the individual to whom care is addressed and the health measure is self declared and not objective. Furthermore, the specification proposed by Wolf and Soldo (1994) can be implemented only limiting the analysis to caring activity provided to a person living within the households, due to lack of data on health status of non cohabitant members. It would then be impossible to apply it to The Netherlands, where cohabitation with the adult in need is not common. For all those reasons I have decided not to adopt that approach.

with

W_t=*1 if* $N_t^* > 0$; .$W_t = 0$ otherwise;

IC_t=*1 if* $H_t^* > 0$;. $IC_t = 0$ otherwise;

t=0,...,T.

where subscripts referred to individual is omitted to simplify the notation and, as before, the x_t is the vector of the explanatory variables, W_{t-1} is the lagged value of the dummy for labour market participation, IC_{t-1} is the lagged value of the dummy for caring activity, while the $\alpha's$, the $\beta's$ and the $\gamma's$ are the parameters to be estimated.

In particular, the error term is decomposed into two parts: a time invariant individual specific component (random effect) and a time variant component. The individual random effect c_j (j=1,2) is supposed to be distributed according to a bivariate normal with variances σ_{c1}^2 and σ_{c2}^2 and covariance $\sigma_{c1}\sigma_{c2}\rho_c$. As in all the random effect specifications, I assume c_j (j=1,2) to be independent with respect to the explanatory variables. The time variant error component (u_{jt}; j=1,2) is hypothesized to be distributed according to a bivariate normal with unitary variances and covariance ρ_u and to be uncorrelated over time. Those variances and correlation parameters are also to be estimated.

Given that the specification is dynamic (i.e. it includes the lagged dependent variable), the presence of unobserved heterogeneity rises the problem of how to model the initial condition (in t=0) in setting the log-likelihood. To solve it, I follow a generalization of the Heckman approach (1981b) adopted by Alessie *et al.* (2004). I estimate two reduced form equations for the first period that do not contain the lagged dependent variable, but contain a linear combination of the random effects. The coefficients of the explanatory variables are allowed to differ from the ones referring to subsequent periods. The equations for these reduced forms are:

$$N_0^* = x_0\widetilde{\alpha} + c_1\lambda_{11} + c_2\lambda_{21} + e_{10} \quad (21)$$

$$H_0^* = x_0\widetilde{\beta} + c_1\lambda_{21} + c_2\lambda_{22} + e_{20} \quad (22)$$

with

W_0=*1 if* $N_0^* > 0; W_0 = 0$ otherwise

IC=*1 if* $H_0^* > 0; IC_0 = 0$ otherwise

$\widetilde{\alpha}'s$, $\widetilde{\beta}'s$, $\lambda's$ and the correlation coefficient between the two error terms e_{10} and e_{20}, labelled ρ_e, are parameters to be estimated. The error terms are supposed to be distributed as a standard normal.

Then, the log-likelihood for this specification is:

$$LogL = \sum_{i=1}^{N} \log \left(\int_{-\infty}^{+\infty} \int_{-\infty}^{+\infty} h_i(c_1, c_2) * \phi_2(c_1, c_2, \Sigma_c) dc_1 dc_2 \right) \tag{23}$$

where:

$$h_i(c_1, c_2) = \Phi_2(w_{i10}, w_{i20}, \rho_{ei0} | x_{i0}) \prod_{t=1}^{T} \Phi_2(w_{i1t}, w_{i2t}, \rho_{uit} | y_{i1t-1}, y_{i2t-1}, ..., x_{it}) \tag{24}$$

and where:

$$\begin{aligned}
w_{ijt} &= q_{ijt} \left(x_{it}\varsigma_j + W_{it-1}\gamma_{j1} + IC_{it-1}\gamma_{j2} + c_{ij} \right) \\
w_{ij0} &= q_{ij0} \left(x_{it}\widetilde{\varsigma}_j + c_{i1}\lambda_{j1} + c_{i2}\lambda_{j2} \right) \\
q_{ijt} &= 2y_{ijt} - 1 \\
\rho_{uit} &= q_{i1t} q_{i2t} \rho_u \\
\rho_{ei0} &= q_{i10} q_{i20} \rho_e
\end{aligned}$$

and $\varsigma_j = \alpha$ if j=1, $\varsigma_j = \beta$ if j=2, $\widetilde{\varsigma}_j = \widetilde{\alpha}$ if j=1, $\widetilde{\varsigma}_j = \widetilde{\beta}$ if j=2.

The subscripts i, t and j respectively indicate the individual, the time and the equation (j=1 is the eq. for work, j=2 is the eq. for care). Φ_2 is the bivariate normal cumulative distribution and $\phi_2(c_1, c_2, \Sigma_c)$ is the joint normally density of the unobserved heterogeneity terms of each equation. The two unobserved heterogeneity terms are supposed to be jointly normally distributed with mean zero and variance-covariance matrix:

$$\Sigma_c = \begin{pmatrix} \sigma_{c1}^2 & \sigma_{c1}\sigma_{c2}\rho_c \\ \sigma_{c1}\sigma_{c2}\rho_c & \sigma_{c2}^2 \end{pmatrix}.$$

The model is estimated by using the Simulated Maximum Likelihood technique, that means that I approximate the double integral in equation 23 by replacing c_1 and c_2 for each individual with R0 independent random draws (couples) from a bivariate normal distribution with variance-covariance matrix Σ_c and by taking the expected value (i.e. the average of the probabilities obtained by such a substitution):

$$\int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} h_i(c_1, c_2) * \phi_2(c_1, c_2, \rho) dc_1 dc_2 = \frac{1}{R0}\sum_{r=1}^{R0} h_i(c_1^r, c_2^r). \tag{25}$$

Those bivariate random draws are obtained by extracting R0*2 draws for each of the N individuals from a standard normal distribution[11] and by multiplying each couple of them by the Cholesky decomposition of the variance-covariance matrix Σ_c.

For a number R0 of random draws that tends to infinity, the estimator is consistent. Asymptotic equivalence to Maximum Likelihood is achieved with a number of random draws that grows faster then $\sqrt{N}$. The program is written in Fortran. The maximization is implemented by using the BFGS algorithm, the default maximization algorithm based on quasi-Newton method in Fortran.

The standard errors are computed by using the BHHH formula (Berndt *et al.* 1974):

$$\left[\sum_{i=1}^{N} s_i(\widehat{\theta}) s_i(\widehat{\theta})'\right]^{-1} \tag{26}$$

where $s_i(\widehat{\theta})$ are the scores (the first derivatives of the log-likelihood with respect to each element of the set of the estimated coefficients).

The marginal effects are estimated, for each equation separately, on the average value of the explanatory variables fixing the unobserved heterogeneity at zero, according to the usual formula $\beta\phi(\beta x)$ (where $\phi(\beta x)$ is the normal density calculated with respect to βx) for the continuous variables and on the basis of the first difference between probabilities for the discrete ones. Standard

[11] More specifically: I extract 2*N*R0 draws from a Halton sequence and I take the inverse of the cumulative normal distribution of each of them, obtaining a series of normal distributed numbers. The advantage of using the Halton draws is that it provides a better coverage and it induces a negative correlation across the observations. This allows us to provide greater accuracy in representing the whole distribution of the error term with a reduced number of extractions (Train, 2003).

errors of the marginal effects are calculated using the Delta Method.

5 Contrasting Italy with respect to The Netherlands

As anticipated, the countries chosen to test the model implications are Italy and The Netherlands. As far as social insurance in general is concerned, in fact, Italy and The Netherlands differ greatly, and the diversity is possibly even more pronounced for elderly care provision. Italy still largely relies on family, while in The Netherlands LTC is provided through both the general health system and through a special fund, financed with contribution from wages and pensions (the Algemene Wet Bijzondere Ziektekosten).

In terms of resources, while the Italian share of GDP devoted to LTC is about 1 per cent, of which almost 50 per cent out of pocket, in The Netherlands it is more than 2.5 per cent and almost completely financed by the state (Huber and Hennessy 2004). In terms of institutionalized care, the percentage of elderly population assisted in Italy is 1.4 per cent, in The Netherlands 8.8 per cent. Population assisted at home by formal carers is respectively 3 per cent and 12 per cent (Lundsgaard 2005, Coda Moscarola 2003).

Moreover, Italy presents, geographically, a very diversified picture, given that benefits in kind are provided at a local level with no requirement to "minimum level and standards"[12] and that only the monetary transfers are centralized. In The Netherlands, on the contrary, provisions are rather more uniform across the regions.

Both countries, however, encourage informal care. From 1995 on, in The Netherlands, the

[12] Available data refer to the period 1998-2001 and are taken from the National Statistical Institute (Istat) website. The Northern area is characterized by the highest percentage of inhabitants aged 65 or more (4 percentage points more than in the Southern regions) and a higher number of structures and interventions for elderly and disabled. Roughly speaking, at the beginning of the observation period (1998), Northern regions (Nord Ovest, Lombardia, Nord Est, Emilia Romagna) have no less than 460 home care interventions and no less than 7 (public or private) structures every 100,000 inhabitants. Regions grouped with the denomination Centro(I) are similar to Northern regions, while Lazio has almost 300 interventions and 6 structures per 100,000 inhabitants. Finally other Central regions (Abruzzo-Molise) have around 100 interventions and 1 institution being more similar to the Southern area (Campania, group of regions denominated Sud, Sicilia and Sardegna) that has at most 114 interventions and maximum 4 structures every 100,000 inhabitants. Lombardia is the region with the greatest number of home care interventions, Sicilia the one with the lowest (only 14 interventions). Emilia Romagna is the first region for what concerns the number of public and private structures, Campania is the latest with only 2 structures. Looking at the evolution of the interventions and of the number of structures over time, it can be noticed that, despite the progressive enlargement, a significant gap between Northern and Southern regions persists.

elderly have a personal budget for care and nursing and they can use it for employing relatives, only if they do not cohabit with them, for providing assistance. The care-giver will be taxed of the income he/she receives like in a formal employment relationship (Lundsgaard 2005). In Italy special permission and pre-retirement opportunities (for maximum two years) are further provided for care-givers if the cared individual is a parent, a child or the spouse (laws n.335/1995 and n.388/2000).

To sum up, the Italian system is such as to fall back on families, with little recognition of the informal care activities delivered within the family, while the Dutch system is largely undertaken by the state, with only a residual role for the family, which is moreover in many cases formally recognized.

Italy and The Netherlands also greatly differ over how the labour market is affected, in that part-time working positions are very rare in Italy, while they are very widespread in The Netherlands. At present, only 14 per cent of the Italian married female working population is employed in part-time jobs. In the Netherlands on the other hand, 51 per cent of married women working have a part-time position (see table 4.2).

These differences can be traced back to various factors. Assuming, however, that household preferences and real wages do not differ substantially across the two countries, one can connect those public policy interventions to economic determinants of behaviour and delineate a few a priories. As pointed out in section 3.2, one should expect that the more efficient the long term care insurance policy of the country, the more "basic care needs" are satisfied by resorting to formal care, implying:

- a lower causal effect of care on work (and *vice versa*): as the reservation wage for substituting one hour of care with one hour of work and the opportunity cost of each hour of leisure are lower;
- a lower role of income on taking informal care decisions and

- a lower state dependence in informal caring, if this is motivated by productivity improvements in informal care provision.

Symmetrically, the more effective the incentives are to provide informal care linked to the effective provision of it, the higher the increase in the number of informal care-givers and/or the higher the expected negative causal effect of care on work.

Finally, the easier the access to part-time positions, the lower the negative causal effect of care on participation and *vice versa*.

Given the institutional differences highlighted above, it is sensible to expect a higher perceived price of formal care in Italy than in The Netherlands, implying for Italy:

- a higher causal effect of care on work (and *vice versa*);
- a greater role of income in explaining caring activities decisions;
- a higher state dependence in care as a proxy of the higher marginal productivity in producing informal care of individuals that have already supplied in the previous period informal care.

6 Data and sample selection

The analysis is based on the European Community Household Panel (ECHP): a representative panel of households and individuals of each of the 12 (later 15) main European countries annually interviewed on income situation, employment status, poverty and social exclusion, housing, health, migration and other social indicators. It consists of 8 waves, from 1994 to 2001. The sample totalled some 60,000 nationally representative households, i.e. approximately 130-160 thousand adults aged 16 or more. The attractive features of the survey are its comparability over time, the range of economic and socio-demographic information that it collects and, of course, the comparability across countries. As for the topic of this paper, it is the only available survey containing information over time on participation and on caring activities addressed by working age individuals to adults in need.

The analysis has been implemented by selecting from the sample of Italy and of The Netherlands the sub-sample of married women aged less than 62 participating continuously in the survey in the years 1994-2001. A woman is considered a care-giver if she answered "yes" to the question "Do your present daily activities include, without pay, looking after a person (who needs help because of old age, disability or illness) other than a child?" (PR006, answers 2 and 3). She works if she declares to work a positive number of hours per week.

As independent variables I use: the lagged value of the dummy for care and work, the age and the age squared, the level of education[13] , the health status, the number of children aged less than 16, the household size, the yearly non labour income, the geographic area of residence (for Italy only: North, Centre or South), the unemployment rate by area and the cohort (calculated as the year of birth minus 1900 and divided by 10). The yearly non-labour income includes the labour and non labour income of all the family members, labour income of the woman excluded. It is expressed in millions of lira per year at 1993 prices for Italy and in thousands of gulden per year at 1993 prices for The Netherlands. Transfers are not included to avoid endogeneity problems: their amount is in fact at least partially dependent on the total household income, women's earnings included.

6.1 Descriptive statistics

Descriptive statistics reported in table 4.1 reveal that compared to Dutch women, Italian women participate less in the labour market and are more involved in informal care activities. Despite the lower participation rates, the average number of hours of work is however higher in Italy than in The Netherlands because those who work are employed full time (see also table 4.2).

In general, participation rates of women who provide care are lower than participation rates of women that do not provide care. The participation rate of women that declare to care is 33.6 per cent among the Italians and 47.6 per cent among the Dutch versus respectively 43.8 per cent

[13] That is maximum if ISCED is 5-7, medium if ISCED is 3 and is low otherwise.

and 62.7 per cent of non carers. Furthermore, while for Italy, the 49 per cent of women that have cared in at least one year in the observed period never worked and the 24 per cent always worked, in The Netherlands only one third never worked and one third always did (see table 4.3).

Not only the number of informal care givers is higher among the Italians than among the Dutch - 12 per cent versus 6 per cent - but also the average number of hours of care supplied by each individual are higher in Italy than in The Netherlands: 16 hours versus 13 hours (for more details see table 4.2). Furthermore Italians provide care for longer periods: among individuals who have cared at least once in the observed period, 37 per cent of the Italians versus the 26 per cent of the Dutch care for at least three years (see table 4.4).

Table 4.1 – Descriptive statistics - pooled sample of households (years 1994-2001)

		Italy		The Netherlands	
		no care	care	no care	care
Wives	number	11,605	1515	6,936	456
	hours of care	0.0	15.9	0.0	13.0
	age	43.3	46.5	40.8	44.8
	participation	43.8%	33.6%	62.7%	47.6%
	total net income	7,193	5,295	11,890	6,632
	hours of work	15.2	10.7	14.5	9.1
	care for someone living inside	0.0%	35.4%	0.0%	11.5%*
	care for someone living outside	0.0%	63.6%	0.0%	88.5%*
Husbands	hours of care	0.2	3.1	0.2	2.1
	age	47.2	50.2	43.3	47.7
	participation	83.0%	74.3%	91.7%	89.7%
	total net income	20,400	17,200	38,834	40,317
	hours of work	34.0	30.4	37.3	36.2
	care for someone living inside	0.6%	11.0%	0.6%	4.6%
	care for someone living outside	1.3%	16.8%	1.4%	15.8%
Others	family hosting an adult	3%	11%	0%	0%
	hours of care provided by others	0.2	0.2	...	...
Children	children aged 16-17	7%	9%	6%	9%
	children aged 18 or more	47%	60%	14%	27%
	hours of care provided by children	0.3	1.2	0.1	0.8
	prob (no work; no care)	50%		34%	
	prob (work; no care)	38%		60%	
	prob (no work; care)	8%		3%	
	prob (work; care)	4%		3%	

Note: * data for wave 1 unavailable. Income respectively in thousands lira (1936.27 Lira=1E uro) and in gulden (2.20371 Gulden=1 Euro). Monetary values are expressed at 1993 prices.

Table 4.2 - Hours of care and of work - married working age women - pooled sample of households (years 1994-2001)

Italy	Care					Work			
	Freq.	Percent.	Cum (% tot. pop.)	Cum (% caring pop.)		Freq.	Percent.	Cum (% tot. pop.)	Cum (% work. pop.)
0h	11,605	88.45	88.45		0h	7,628	58.14	58.14	
1h-14h	650	4.95	93.41	43%	1h-20h	753	5.74	63.88	14%
14h-28h	500	3.81	97.22	33%	20h-40h	3,867	29.47	93.35	70%
over 28h	365	2.78	100.00	24%	over 40h	872	6.65	100.00	16%
Total	13,120	100			Total	13,120	100		

The Netherlands	Care					Work			
	Freq.	Percent.	Cum (% ot pop.)	Cum (% caring pop.)		Freq.	Percent.	Cum (% tot. pop.)	Cum (% work pop.)
0h	6,936	93.83	93.83		0h	2,754	37.26	37.26	
1h-14h	266	3.60	97.43	58%	1h-20h	2,381	32.21	69.47	51%
14h-28h	146	1.98	99.40	32%	20h-40h	2,120	28.68	98.15	46%
over 28h	44	0.60	100.00	10%	over 40h	137	1.85	100.00	3%
Total	7,392	100			Total	7,392	100		

As shown in table 4.5, Italians have a higher probability of starting care activity and a lower probability of exiting from it (5.4 versus 3.9 and 47.1 versus 56.3). At the same time, they tend to retain their labour market status more permanently than the Dutch. In Italy, 95 per cent of women who are observed not to work in t-1, still do not work in t and 92.1 per cent of women observed working in t-1, also work in t. In The Netherlands the status of non worker persists instead for 84.7 per cent of non workers and 91.8 per cent of the workers. The probability of starting to work for Italian women is 5 per cent versus 15.3 per cent of Dutch women.

Finally, Italians are more likely to cohabit with the adult in need. Cohabitation involves 35.4 per cent of Italian carers against 11.5 per cent of the Dutch ones (see table 4.1).

Table 4.1 also reports some interesting information about the other cohabitant members of the households the interviewed women live in. Data confirm that the percentage of male care-giver and the average number of hours provided by men is much lower than for women in both countries (less then 3.2 hours per week), but again Italian men appear to work less and care more than their Dutch counterparts.

Table 4.3 – Years of work by number of years of caring activity per woman at the end of the observed period (years 1994-2001)

Italy	Years of care									
Years of work if year of care>=1	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	**% by year of work**
0	104	45	36	34	21	17	16	6	279	49%
1	16	10	5	1	2	2	2	2	40	7%
2	7	5	1	2	6	1	0	0	22	4%
3	8	2	3	4	3	0	1	0	21	4%
4	13	5	0	1	0	0	0	0	19	3%
5	12	5	1	1	1	0	0	0	20	3%
6	9	2	0	0	1	0	0	0	12	2%
7	14	2	2	3	3	0	1	0	25	4%
8	60	30	19	6	4	7	8	3	137	24%
Total	243	106	67	52	41	27	28	11	575	
% by years of care	42%	18%	12%	9%	7%	5%	5%	2%	100%	

The Netherlands	Years of care									
Years of work if year of care>=1	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	**% by year of work**
0	30	18	6	2	4	3	1	1	65	30%
1	10	5	0	0	1	1	1	0	18	8%
2	4	1	3	1	1	0	0	0	10	5%
3	6	2	2	0	0	0	0	0	10	5%
4	7	3	2	1	0	1	0	0	14	6%
5	8	1	2	1	0	0	0	0	12	5%
6	6	3	0	0	0	2	0	0	11	5%
7	7	5	2	0	0	0	0	0	14	6%
8	38	9	8	5	2	1	3	0	66	30%
Total	116	47	25	10	8	8	5	1	220	
% by years of care	53%	21%	11%	5%	4%	4%	2%	0%	100%	

The Dutch average household composition is quite different from the Italian one: the percentage of cohabitant children aged 18 or more is much lower and the percentage of households hosting an adult (beside the spouse) is almost zero. However, in both countries the households in which the woman declares to be a carer present some common distinctive characteristics with respect to households in which the woman is not a carer:

- the relative percentage of children aged 18 or more is higher;
- the age of the care-givers is higher than the age of the non care-givers and, as expected, the participation rate, the average number of hours of work and the annual labour income are lower;

- the other members of the households help in taking care of people in need (presumably when they are not the individuals to whom the care activity is addressed).

Table 4.4 - Cumulative number of years of care per woman in the observed period (years 1994-2001)

Italy				
Years of care	Freq.	Percentage	Cumulative (%total pop.)	Cumulative (%caring pop.)
0	1,065	64.94	64.94%	
1	243	14.82	79.76%	42.26%
2	106	6.46	86.22%	18.43%
3	67	4.09	90.30%	11.65%
4	52	3.17	93.48%	9.04%
5	41	2.50	95.98%	7.13%
6	27	1.65	97.62%	4.70%
7	28	1.71	99.33%	4.87%
8	11	0.67	100.00%	
Total	1,640	100.00		

The Netherlands				
Years of care	Freq.	Percentage	Cumulative (%total pop.)	Cumulative (%caring pop.)
0	704	76.19	76.19%	
1	116	12.55	88.74%	52.73%
2	47	5.09	93.83%	21.36%
3	25	2.71	96.54%	11.36%
4	10	1.08	97.62%	4.55%
5	8	0.87	98.48%	3.64%
6	8	0.87	99.35%	3.64%
7	5	0.54	99.89%	2.27%
8	1	0.11	100.00%	
Total	924	100.00		

Table 4.5 - Markovian transition frequencies (probabilities in parenthesis) - women - years 1994-2001

Italy		
	no care	*care*
no care	9,584	549
	(94.58)	(5.42)
care	635	712
	(47.14)	(52.86)
	no work	*work*
no work	6,320	330
	(95.04)	(4.96)
work	380	4450
	(7.87)	(92.13)

The Netherlands		
	no care	*Care*
no care	5,837	237
	(96.1)	(3.9)
care	222	172
	(56.35)	(43.65)
	no work	*Work*
no work	2,059	373
	(84.66)	(15.34)
work	333	3703
	(8.25)	(91.75)

7 Results

Estimation results in tables 4.6 and 4.7 reveal the absence of a causal effect of care on work in The Netherlands, while signs of it are detected for Italy. In both countries neither the coefficient of lagged care activity in the work equation nor the coefficient of the lagged work activity in the care equation are significant, but for Italy I find a significant and negative correlation among the time variant error terms. That evidence can signal the presence of negative causality, even if results do not altogether support the specification introduced by Heitmueller and Michaud (2006). The direction of the causality - if from care to work or from work to care or even in both directions - is however not identified. Such a correlation in the time variant terms can also be due to unobserved time specific shocks negatively correlated across equations, but, if any, their nature is not so immediate.

If the model's prediction that wants causality between work and care to be linked to the degree of completeness in the coverage of LTC expenditures does not find unambiguous confirmation, better results are obtained concerning other implications of the model. First of all, non labour income shows a significant negative effect in explaining informal caring choices of Italian women, while it plays no role in explaining Dutch women's behaviour. In Italy, where the cost of formal care provision for satisfying "basic" needs is directly charged to the households, the income becomes a discriminating factor in informal caring decisions. In The Netherlands, where those costs are covered by insurance, informal caring decisions abstract from economic status of the household.

Furthermore, a significant state dependence in caring activity is found in both countries, but for The Netherlands it is lower than for Italy. Evidence confirms that, in the presence of a comprehensive coverage of the expenditures for formal care, variables that proxy marginal productivity in producing informal care have a minor role in explaining caring decisions.

Additional interesting results are the important role of state dependence in working decisions and the significant role of unobserved heterogeneity in explaining both working and caring choices.

Having worked in the previous period increases the participation probability of 60.4 pp. in Italy and of 48.2 per cent in The Netherlands. In Italy the variance of the unobserved heterogeneity represents 70 per cent of the total error variance in the work equation and 50 per cent of the variance in the care equation. In The Netherlands, it explains respectively 58 per cent and 40 per cent. Unobserved characteristics determining decisions appear to be negatively correlated across the equations, signalling the presence of groups of individuals whose characteristics lead them to be more prone to "caring and not working" and of groups more prone to "working and not caring".

Table 4.6 - Base specification with macro area dummies - years 1994-2001 - Italy

		Coeff.	Std. Dev.	Z	Mfx.	Std. Dev.	Z
Work (t>t0)	$Work_{t-1}$	**1.820**	0.067	27.202	**0.604**	0.038	15.716
	$Care_{t-1}$	0.165	0.104	1.589	0.057	0.037	1.544
	Age	**0.314**	0.051	6.103	**0.104**	0.018	5.809
	Age squared	**-0.004**	0.001	-6.747	**-0.001**	0.000	-6.149
	Education_ third level	**1.440**	0.185	7.779	**0.528**	0.057	9.270
	Education_ second level	**0.741**	0.088	8.401	**0.257**	0.030	8.649
	Wife disability status	**-0.376**	0.160	-2.356	**-0.109**	0.040	-2.749
	Children	-0.081	0.057	-1.430	-0.027	0.019	-1.430
	Size	**-0.156**	0.055	-2.850	**-0.052**	0.018	-2.807
	Wife non working income	0.001	0.001	0.942	0.360*	0.382*	0.943
	Unemployment	-0.015	0.015	-1.005	-0.005	0.005	-0.994
	Cohort	0.151	0.147	1.025	0.050	0.048	1.030
	North	**0.674**	0.197	3.422	**0.233**	0.066	3.504
	Center	**0.373**	0.166	2.242	**0.130**	0.059	2.198
	Constant	**-7.867**	1.734	-4.537			
Care (t>t0)	$Work_{t-1}$	0.002	0.095	0.018	0.000	0.006	0.018
	$Care_{t-1}$	**0.780**	0.065	12.040	**0.094**	0.016	5.854
	Age	**0.188**	0.045	4.171	**0.012**	0.004	3.412
	Age squared	**-0.002**	0.000	-5.144	**-0.159***	0.045*	-3.539
	Education_ third level	0.084	0.143	0.586	0.006	0.011	0.547
	Education_ second level	**0.136**	0.072	1.894	**0.009**	0.005	1.798
	Wife disability status	0.008	0.146	0.057	0.001	0.010	0.056
	Children	-0.037	0.044	-0.823	-0.002	0.003	-0.820
	Size	**0.104**	0.036	2.858	**0.007**	0.003	2.728
	Wife non working income	**-0.007**	0.002	-4.335	**-0.470***	0.124*	-3.791
	Unemployment	-0.013	0.011	-1.178	-0.001	0.001	-1.196
	Cohort	**-0.610**	0.127	-4.805	**-0.040**	0.020	-1.980
	North	-0.011	0.137	-0.078	-0.001	0.009	-0.079
	Center	-0.070	0.118	-0.597	-0.005	0.007	-0.616
	Constant	-2.201	1.612	-1.365			
	Sigma_work	**1.519**	0.128	11.832			
	Sigma_care	**0.992**	0.059	16.909			
	Rho_c**	**-0.216**	0.070	-3.189			
	Rho_u_t**	**-0.299**	0.133	-2.391			
	Log-likelihood	-6831.21					
	Observations	13048					
	Halton draws	70					
	Periods	8					

Note: Mfx are the partial effects calculated with respect to the average value of the explanatory variables, fixing unobserved heterogeneity at zero. Standard errors are calculated with the Delta Method. Sigma_work and sigma_care are the standard deviations in the equation for work and care respectively. Rho_c and rho_u_t are the correlation coefficients of the unobserved heterogeneity and of the time variant error component of the periods from the second on. Income is expressed in millions lira at 1993 prices. In the Italian sample, for 72 observations macro-region is not reported. Those observations are excluded from regressions. *multiplied by 1000. **Standard errors and t-statistics are referred to the inverse of the hyperbolic tangent. Coefficients significant at the 5 per cent level in bold.

Table 4.7 - Base specification - years 1994-2001 - The Netherlands

		Coeff.	Std. Dev.	Z	Mfx.	Std. Dev.	Z
Work (t>t0)	$Work_{t-1}$	**1.442**	0.065	22.275	**0.482**	0.030	15.827
	$Care_{t-1}$	0.045	0.159	0.286	0.016	0.054	0.289
	Age	**0.322**	0.107	3.010	**0.111**	0.037	3.014
	Age squared	**-0.004**	0.001	-5.949	**-0.001**	0.000	-5.990
	Education_ third level	**0.349**	0.137	2.553	**0.111**	0.039	2.843
	Education_ second level	0.145	0.094	1.535	0.049	0.032	1.560
	Wife disability status	**-0.911**	0.136	-6.713	**-0.349**	0.050	-6.991
	Children	**-0.272**	0.075	-3.626	**-0.094**	0.026	-3.652
	Size	-0.070	0.073	-0.962	-0.024	0.025	-0.962
	Wife non working income	**-0.002**	0.001	-2.086	**-0.590***	0.283*	-2.088
	Unemployment	-0.067	0.124	-0.538	-0.023	0.043	-0.539
	Cohort	0.690	0.915	0.754	0.238	0.316	0.755
	Constant	-9.963	9.543	-1.044			
Care (t>t0)	$Work_{t-1}$	-0.124	0.124	-1.000	-0.005	0.006	-0.965
	$Care_{t-1}$	**0.723**	0.120	6.038	**0.062**	0.021	2.971
	Age	0.157	0.127	1.235	0.007	0.006	1.142
	Age squared	**-0.002**	0.001	-2.331	-0.072*	0.060*	-1.202
	Education_ third level	0.018	0.159	0.115	0.001	0.007	0.113
	Education_ second level	0.085	0.111	0.771	0.004	0.005	0.732
	Wife disability status	-0.004	0.161	-0.027	0.000	0.007	-0.027
	Children	-0.070	0.072	-0.979	-0.003	0.003	-0.947
	Size	0.067	0.073	0.922	0.003	0.003	0.897
	Wife non working income	0.001	0.001	1.025	0.042*	0.042*	0.981
	Unemployment	0.010	0.144	0.071	0.000	0.006	0.071
	Cohort	-0.151	1.065	-0.142	-0.007	0.047	-0.140
	Constant	-5.009	11.174	-0.448			
	Sigma_work	**1.184**	0.103	11.523			
	Sigma_care	**0.816**	0.087	9.417			
	Rho_c**	**-0.224**	0.106	-2.148			
	Rho_u_t**	0.171	0.235	0.734			
	Log-likelihood	-3919.68					
	Observations	7392					
	Random draws	70					
	Periods	8					

Note: Mfx are the partial effects calculated with respect to the average value of the explanatory variables, fixing unobserved heterogeneity at zero. Standard errors are calculated with the Delta Method. Sigma_work and sigma_care are the standard deviations in the equation for work and care respectively. Rho_c and rho_u_t are the correlation coefficients of the unobserved heterogeneity and of the time variant error component of the periods from the second on. Income is expressed in thousands gulden at 1993 prices. *multiplied by 1000. **Standard errors and t-statistics are referred to the inverse of the hyperbolic tangent. Coefficients significant at the 5 per cent level in bold.

Concerning Italy, estimations reveal that the probability of working and caring increase with age, but the marginal contributions of each additional year are each time lower (given the negative and significant coefficients of the age squared terms). The highest levels of education are related

to participation with the expected sign. In the caring equation, secondary education has a positive effect with respect to lower educational levels, while the highest level of education does not. As a proxy of potentiality of career or of a sort of socio-economic gradient, I would expect a negative sign for those two variables. A bad health status or a disability significantly reduce participation of around 11 pp. but do not affect care. The presence of children aged less than 16, though being a competing demand of time with respect to caring and working, surprisingly does not have a significant effect on both (perhaps only small children and new born have, see Michaud and Tatsiramos 2005). The size of the household also reduces participation, but increases the probability of caring because probably it proxies the presence of ill/disabled cohabitant members in the household. In particular, each additional member of the household decreases the probability of working by about 5.2 pp. and increases the probability of caring by 0.7 pp.. The non labour income does not play a significant role in explaining participation while it was expected to reduce it if leisure is a normal goods. The local unemployment level has no effect either on caring nor on working. Its effect on participation is in fact caught by the macro-regional dummies[14] . As for informal caring choices, the unemployment level by macro-regions was originally meant to proxy the business cycle effect on household income expectations and on consumption planning. Finally, estimations reveal that the cohort effect has a significant role in explaining caring choices: younger cohorts care less; it has however no effect on participation. The cohort 1965 has a probability of caring of 8 pp. lower[15] than cohort 1945.

Running the regressions on the sample of working age women living in The Netherlands (table 4.7), further differences emerge. The education level counts less in explaining participation. The third degree of education increases participation by about 11.1 pp. versus 52.8 for Italy. The health status plays a greater role in explaining participation, bad health induces a reduction in participation by almost 34.9 pp.. The presence of children significantly reduces participation (-9.4

[14] By trying a specification in which regional dummies are omitted, unemployment becomes significant.

[15] The cohort is expressed as the year of birth minus 1900 divided by 10. Each unit increase in the variable represents a lag of 10 years across cohorts.

pp. each child), while size turns out to be non significant, probably due the reduced propensity of the Dutch to cohabit with adult children or other adults. The income is effective in reducing participation, but its effect is rather small. The care equation is instead not precisely estimated. Only lagged caring choice and age squared coefficients are significant.

Finally, in order to disentangle the effect of the differences in the LTC policies from the one of the differences in the labour market institutions, I have estimated the model on the sub-sample of Northern Italy only (see table 4.8). Northern Italy in fact is supposed to have a labour market that is more similar to The Netherlands. The role of the regressors is significantly different from both Italy overall and from The Netherlands, especially for what concerns the participation equation. In the equation for work I have observed less state dependence and a lower role of the third level of education; however both of them are still higher than for The Netherlands.

The age, the family size and the cohort assume a greater role in absolute terms. The illness/disability status becomes non significant and the positive effect of the non labour income is now significant. As for the equation of care, the detected state dependence is even higher than for Italy as a whole and, then, much higher than for The Netherlands. The effects of age, household size and income (in absolute terms) are stressed, while the cohort loses significance. Estimations lead to the same conclusions as before for what concerns the testable implications of the theoretical model, except for the fact that I no longer find a significant negative correlation between care and work.

Estimations of the parameters of initial condition equations are reported in Appendix.

Table 4.8 – Base specification – Northern Italy - years 1994-2001 – Italy

		Coeff.	Std. Dev.	Z	Mfx.	Std. Dev.	Z
Work (t>t0)	$Work_{t-1}$	**1.566**	0.120	13.070	**0.560**	0.037	14.981
	$Care_{t-1}$	-0.045	0.290	-0.154	-0.018	0.115	-0.154
	Age	**0.680**	0.125	5.424	**0.269**	0.049	5.467
	Age squared	**-0.008**	0.001	-5.452	**-0.003**	0.001	-5.510
	Education_ third level	**1.242**	0.566	2.194	**0.380**	0.099	3.855
	Education_ second level	0.199	0.162	1.233	0.079	0.063	1.244
	Wife disability status	-0.371	0.301	-1.231	-0.147	0.117	-1.255
	Children	-0.169	0.142	-1.192	-0.067	0.056	-1.193
	Size	**-0.388**	0.136	-2.862	**-0.154**	0.054	-2.829
	Wife non working income	**0.005**	0.002	2.931	**1.798***	0.616*	2.916
	Unemployment	0.082	0.104	0.794	0.033	0.041	0.795
	Cohort	**1.496**	0.466	3.211	**0.592**	0.184	3.220
	Constant	**-22.505**	5.408	-4.162			
Care (t>t0)	$Work_{t-1}$	-0.057	0.180	-0.314	-0.004	0.012	-0.312
	$Care_{t-1}$	**0.920**	0.117	7.887	**0.119**	0.033	3.673
	Age	**0.328**	0.102	3.218	**0.021**	0.008	2.527
	Age squared	**-0.003**	0.001	-3.169	**-0.202***	0.000	-2.419
	Education_ third level	0.202	0.237	0.852	0.015	0.021	0.732
	Education_ second level	0.010	0.119	0.085	0.001	0.008	0.085
	Wife disability status	0.049	0.235	0.209	0.003	0.017	0.200
	Children	-0.011	0.083	-0.134	-0.001	0.005	-0.133
	Size	**0.175**	0.066	2.651	**0.011**	0.005	2.367
	Wife non working income	**-0.010**	0.002	-4.325	**-0.669***	0.199*	-3.364
	Unemployment	0.061	0.066	0.923	0.004	0.004	0.923
	Cohort	-0.124	0.338	-0.367	-0.008	0.022	-0.362
	Constant	**-10.056**	4.288	-2.345			
	Sigma_work	**2.158**	0.301	7.173			
	Sigma_care	**0.879**	0.099	8.877			
	Rho_c**	-0.193	0.138	-1.397			
	Rho_u_t**	-0.102	0.229	-0.446			
	Log-likelihood	-2370.63					
	Observations	4520					
	Random draws	70					
	Periods	8					

Note: Mfx are the partial effects calculated with respect to the average value of the explanatory variables, fixing unobserved heterogeneity at zero. Standard errors are calculated with the Delta Method. Sigma_work and sigma_care are the standard deviations in the equation for work and care respectively. Rho_c and rho_u_t are the correlation coefficients of the unobserved heterogeneity and of the time variant error component of the periods from the second on. Income is expressed in millions lira at 1993 prices. In the Italian sample, for 72 observations macro-region is not reported. Those observations are excluded from regressions. *multiplied by 1000. **Standard errors and t-statistics are referred to the inverse of the hyperbolic tangent. Coefficients significant at the 5 per cent level in bold.

7.1 Policy simulations

Simulations addressed to quantify the influence of the institutional environment on working and caring patterns of Italian and Dutch women are reported in table 4.9. The exercise follows the approach used in Del Boca and Sauer (2006). It takes the sample of Italian women in the last observed year and it applies to it the estimated coefficients for Dutch women in order to understand how participation and informal care will vary under a different policy. The symmetrical exercise is also done for the Dutch women. In the exercise the unobserved heterogeneity is fixed at zero and all estimated coefficients are used, non significant ones included.

Under the Dutch policies, the predicted probability of Italian women working, would increase, while the one of caring would decrease. In particular, for Italian women, the probability of working conditional on caring would increase from 26.6 per cent to 45.5 per cent; the probability of working conditional on non caring would go from 33.4 to 35.0. The predicted probability of caring conditional on working would decrease from 9.3 per cent to 1.2 per cent. The predicted probability of caring conditional on non working would go from 15.6 to 0.8. On the contrary, under the Italian policies, the quoted predicted conditional probabilities for Dutch women would shift respectively from 39.3 per cent to 24.2 per cent, from 56.2 to 33.8, from 0.19 per cent to 7.35 per cent and from 0.2 to 11.2.

However, in interpreting these results, a note of caution is in order. Such a simulation is valid only under the assumption that the institutional environment is exogenous with respect to preferences. Furthermore, the coefficients for The Netherlands are estimated only imperfectly.

Table 4.9 – Average joint and conditional probabilities observed, predicted, simulated exchanging intervention policies across countries

	Italy			The Netherlands		
	Observed (for comparison)	Predicted for comparison)	Simulated under Dutch policy	Observed (for comparison)	Predicted for comparison)	Simulated under Italian policy
Joint probability of working and caring	3.65%	3.95%	0.28%	2.94%	0.13%	2.31%
Probability of working conditional on caring	31.52%	26.64%	45.45%	47.59%	39.27%	24.21%
Probability of working conditional on non caring	43.28%	33.43%	35.01%	63.74%	56.17%	33.78%
Probability of caring conditional on working	8.70%	9.25%	1.19%	4.68%	0.19%	7.35%
Probability of caring conditional on non working	13.64%	15.58%	0.83%	8.68%	0.17%	11.15%

Note: conditional probabilities are calculated according to the formulas in p. 910 of Greene (1997).

8 Conclusions

The paper investigates the dynamics of caring and working choices of individuals, focusing on the bidirectional causality relationship between decisions. The analysis is conducted on the ECHP panel sample of working age married women of two countries, Italy and The Netherlands, with the intent to highlight the role of institutions in determining participation and caring choices. Indeed, while in Italy care directed to adults in need still largely relies on the family, in The Netherlands an almost complete coverage of long term care (LTC) expenditures risks is provided through both the general health system and through a special fund. Furthermore, in The Netherlands the access to part-time working positions is easier.

By developing, in a static framework, a model of optimal time allocation and consumption for an altruistic individual whose parent becomes ill or disabled, some testable policy implications are derived. The more comprehensive coverage provision granted and the easier access to part-time jobs in The Netherlands with respect to Italy would lead to a lower negative causal effect of care on labour market participation, to a lower state dependence in caring decisions and to a reduced role of income levels in determining caring choices.

To test those implications, following Alessie *et al.* (2004), I estimated a multivariate dynamic

binary probit of working and caring choices throughout the simulated maximum likelihood technique. Causality patterns are identified by adopting the approach of Heitmueller and Michaud (2006).

Estimations do not reveal a significant causal effect between caring and labour market participation decisions of working age married women in The Netherlands, while there are some signs of it for Italy. The detected negative and significant correlation among the time variant error component of the two equations for Italy can in fact be signalling the presence of causality. The presence and the direction of the causality - from care to work or *vice versa* or even in both directions - are however not unequivocally identified. The lack of strong evidence relative to causality does not, however, deny the fact that the adoption of more effective care provision in Italy would have a significant effect. In particular, a policy like the one adopted in The Netherlands would lead to be less dependent on household income, showing itself to be welfare improving. As a side effect, care-giving decisions will also be less state dependent.

Not only differences in health care institutions and in part-time jobs availability, but also other differences in labour market institutions can play a role in the choice of caring and working. I did not go further into this topic in the present work, but in order to mitigate those potential effects, I have repeated the analysis by considering Northern Italy only, instead of Italy overall. The Northern regions labour market is in fact more similar to the one of The Netherlands. Such analysis confirms the main findings of previous analysis except for the fact that the negative correlation between care and work time variant error terms is not now significant: the presence of causality is then excluded.

A simulation exercise directed to evaluate what will be the effect of the adoption in Italy of the Dutch policy shows that the predicted probability of working would increase, while the predicted probability of caring would decrease sensibly. Mirror results are obtained by simulating the effect of Italian policy (or absence of policy) on Dutch women's choices. The results of course encounter limitations in the partial equilibrium analysis and in the supposed exogeneity of policies

with respect to preferences. Coefficients of the care equation for The Netherlands are furthermore only imprecisely estimated. Finally, it has to be mentioned that the ability of the model to draw unambiguous conclusions on the topic can be potentially limited by the fact that exposure to the risk of having to provide care cannot be controlled for (there is no information on the number of alive parents of the couple and their health conditions) and there are no data on the cost of formal care.

Future works can extend and deepen the present analysis in several directions. Analysis can be completed by ranking other European countries included in the ECHP survey on the bases of the coverage granted by their long term care policies and by checking the strength of the theoretical implications derived on this enlarged group of states. From the point of view of the estimation technique, removing the independency assumption between the unobserved heterogeneity term and the explanatory variables implied by the random effect approach is worth pursuing. A solution à la Chamberlain (as illustrated in Wooldridge 2002) is a natural starting point. Afterwards, fixed effect linear model estimations can be implemented in order to strengthen the validity of the conclusions. Subsequently, the focus can be shifted on the intensive margin by looking at the causal effect of the effort in caring on the effort in working, both measured by the number of hours dedicated to each activity.

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Appendix: Estimations of the initial conditions

Table A1 - Base specification with macro area dummies - Initial Condition - years 1994-2001 - Italy

		Coeff.	Std. Dev.	Z
Work t0	Age	0.172	1.932	0.089
	Age squared	**-0.005**	0.001	-4.253
	Education_ third level	**2.141**	0.321	6.671
	Education_ second level	**1.129**	0.174	6.496
	Wife disability status	0.000	0.455	-0.001
	Children	**-0.280**	0.098	-2.860
	Size	**-0.245**	0.090	-2.731
	Wife non working income	-0.004	0.004	-1.047
	Unemployment	**-0.075**	0.035	-2.150
	Cohort	-1.861	19.076	-0.098
	North	**0.610**	0.328	1.863
	Center	0.324	0.269	1.204
	Constant	11.993	179.725	0.067
Care t0	Age	0.080	3.885	0.021
	Age squared	**-0.002**	0.001	-1.900
	Education_ third level	0.221	0.227	0.974
	Education_ second level	0.111	0.122	0.909
	Wife disability status	-0.386	0.528	-0.731
	Children	**-0.133**	0.074	-1.794
	Size	**0.204**	0.067	3.040
	Wife non working income	-0.004	0.002	-1.610
	Unemployment	-0.028	0.024	-1.174
	Cohort	-0.943	39.012	-0.024
	North	-0.171	0.216	-0.793
	Center	-0.085	0.186	-0.460
	Constant	3.121	366.235	0.009
	Rho_e_{t0}**	-0.077	0.059	-1.300
Heckman terms	λ_{11}	1.344	0.157	8.550
	λ_{12}	0.049	0.104	0.470
	λ_{21}	0.089	0.059	1.496
	λ_{22}	0.983	0.131	7.529

Note: rho_e_{t0} is the correlation coefficient of the time variant error component of the first period. Lambda's are the coefficients of the Heckman initial conditions, see section 4.4. Income is expressed in millions lira at 1993 prices. **Standard errors and t-statistics are referred to the inverse of the hyperbolic tangent. Coefficients significant at the 5 per cent level in bold.

Table A2 - Base specification - Initial Condition - years 1994-2001 - The Netherlands

			Coeff	Std. Dev.	Z
Work (t0)	Age		-0.367	0.878	-0.418
	Age squared		**-0.004**	0.001	-3.141
	Education_ third level		**0.663**	0.238	2.790
	Education_ second level		**0.294**	0.164	1.796
	Wife disability status		0.062	1.051	0.059
	Children		**-0.604**	0.179	-3.378
	Size		-0.107	0.166	-0.641
	Wife non working income		-0.003	0.002	-1.278
	Unemployment		-0.922	6.929	-0.133
	Cohort		-6.348	8.447	-0.752
	Constant		**63.330**	34.438	1.839
Care (t0)	Age		0.310	3.643	0.085
	Age squared		-0.003	0.002	-1.267
	Education_ third level		-0.762	0.599	-1.271
	Education_ second level		0.060	0.291	0.207
	Wife disability status		-3.361	31733.608	0.000
	Children		0.126	0.280	0.449
	Size		-0.163	0.226	-0.719
	Wife non working income		-0.006	0.007	-0.839
	Unemployment		-0.040	25.082	-0.002
	Cohort		0.184	36.366	0.005
	Constant		-9.787	257.526	-0.038
	Rho_e_{t0}**		-0.087	0.068	-1.269
Heckman terms		λ_{11}	**1.157**	0.145	7.954
		λ_{12}	-0.011	0.158	-0.067
		λ_{21}	0.044	0.146	0.304
		λ_{22}	**1.374**	0.423	3.245

Note: rho_e_{t0} is the correlation coefficient of the time variant error component of the first period. Lambda's are the coefficients of the Heckman initial conditions, see section 4.4. Income is expressed in thousands gulden at 1993 prices. **Standard errors and t-statistics are referred to the inverse of the hyperbolic tangent. Coefficients significant at the 5 per cent level in bold.

Table A3 - Base specification – Northern Italy - Initial Condition - years 1994-2001 - Italy

			Coeff	Std. Dev.	Z
Work (t0)	Age		0.331	1.871	0.177
	Age squared		**-0.008**	0.002	-3.562
	Education_ third level		**1.093**	0.550	1.986
	Education_ second level		**0.439**	0.267	1.645
	Wife disability status		-4.917	53024.384	0.000
	Children		**-0.497**	0.219	-2.272
	Size		**-0.547**	0.208	-2.634
	Wife non working income		0.166*	5.368*	0.031
	Unemployment		-0.246	0.182	-1.356
	Cohort		-2.447	18.000	-0.136
	Constant		18.216	169.881	0.107
Care (t0)	Age		0.101	1.784	0.057
	Age squared		-0.002	0.002	-0.916
	Education_ third level		**0.913**	0.416	2.197
	Education_ second level		0.337	0.235	1.436
	Wife disability status		-0.560	1.310	-0.427
	Children		-0.132	0.175	-0.754
	Size		0.159	0.121	1.315
	Wife non working income		**0.019**	0.005	-3.799
	Unemployment		0.115	0.150	0.768
	Cohort		-0.790	18.116	-0.044
	Constant		0.481	169.492	0.003
	Rho_e_{t0}**		-0.148	0.123	-1.213
Heckman terms		λ_{11}	**1.005**	0.184	5.456
		λ_{12}	-0.088	0.226	-0.388
		λ_{21}	0.027	0.073	0.363
		λ_{22}	**1.136**	0.289	3.923

Note: rho_et0 is the correlation coefficient of the time variant error component of the first period. Lambda's are the coefficients of the Heckman initial conditions, see section 4.4. Income is expressed in millions lira at 1993 prices. **Standard errors and t-statistics are referred to the inverse of the hyperbolic tangent. Coefficients significant at the 5 per cent level in bold.

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