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

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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, the absence of a 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.

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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 Charles 1998 and 2003, Viitanen 2005). 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

[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).

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. 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 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 simultaneity 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 2. Section 3 describes the theoretical framework. Section 4 introduces the econometric specification used. Section 5 illustrates the institutional framework for the assistance to ill/disabled in the two countries. Section 6 presents the data used in the empirical analysis and shows some descriptive statistics. Results and conclusions are reported in section 7 and 8.

[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.

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 on 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.

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. 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) for example, but many other studies do not have the necessary information on parents.

Finally, results depend on the provision of help from other family members (Börsch-Supan *et al.* 1992) and on the availability of substitutes for 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.

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

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 percentage points (pp.) for co-residential carers and of -1.1 pp. for extra-residential ones, while being a cohabitant care-giver lowers the probability of working of about 5.9 pp..

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 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. As usual, f is supposed to have diminishing marginal returns.

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

[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.

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 (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 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:

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

[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).

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 ($w_{leisure}$, 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

[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 (Gronau 1986).

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.

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, as $f'(H)$ enters equation 11 multiplied by p_F;
- finally, 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.e. acts as a necessary good), I expect a lower effect of income in explaining informal care provision. In fact, "basic care" needs will be satisfied mainly through formal care provided for free, while informal care is expected to cover a marginal role, primarily addressed to the satisfaction of "extra" needs for which there are no substitutes available in the market.

On the other hand, incentives towards informal care provisions that link the transfer amount to the effective provision of care potentially lead 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 accessibility to part-time positions and I compare the estimates obtained.

In doing that I will focus on the extensive margin. Working and caring decisions are modelled as discrete choices. The individual is called to choose among four possible alternatives: work and care, work and not care, care and not work, not care and not work.

I 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. Furthermore individuals are likely to form habits and might dislike changes in their daily activities. Finally, 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, state dependence can be motivated by human capital accumulation (Heckman 1981a) and by search costs (Eckstein and Wolpin 1990, Hyslop 1999), as they deeply affect market wages, or again by habits formation (Hotz *et al.* 1988).

For each of the K 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):

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

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

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.

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)[8]. The time variant unobserved determinants of the choice (v_{1t} and v_{2t}) are supposed to be independent across equations.

The reduced form for this model is given by:

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

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

where:

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

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

[8]The market wage does not directly enter the equations to be estimated as the solution of the system of first order conditions reasonably implies. 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 I do not observe working). In this way I lose the information on the direct effect of market wages in determining the choices, but I keep off the selection bias problems and the endogeneity problems that are raised when market wages are directly considered in the equations.

$\overline{v}_{1t}$ and $\overline{v}_{2t}$ is in fact equal to:

$$Cov(\overline{v}_{1t}, \overline{v}_{2t}) = \frac{(\gamma^*_{13}\sigma^2_2 + \gamma^*_{23}\sigma^2_1)}{(1 - \gamma^*_{13}\gamma^*_{23})^2}$$

In case the covariance is negative, either γ^*_{13} or γ^*_{23} or both are negative[9].

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.* (2001 and 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:

$$N^*_t = x_t\alpha + W_{t-1}\gamma_{11} + IC_{t-1}\gamma_{12} + c_1 + u_{1t} \quad (18)$$

$$H^*_t = x_t\beta + W_{t-1}\gamma_{21} + IC_{t-1}\gamma_{22} + c_2 + u_{2t} \quad (19)$$

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,

[9] 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 quite rare. For all these reasons I have decided not to adopt that approach.

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^2_{c1} and σ^2_{c2} 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.* (2001 and 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:

$$N_0^* = x_0\widetilde{\alpha} + c_1\lambda_{11} + c_2\lambda_{21} + e_{10} \tag{20}$$

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

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:

$$LogL = \sum_{i=1}^{K} \log\left(\int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} h_i(c_1, c_2) * \phi_2(c_1, c_2, \Sigma_c)dc_1dc_2\right) \tag{22}$$

where:

$$h_i(c_1, c_2) = \Phi_2(w_{i10}, w_{i20}, \rho_{ei0}|x_{i0})\prod_{t=1}^{T}\Phi_2(w_{i1t}, w_{i2t}, \rho_{uit}|y_{i1t-1}, y_{i2t-1}, ..., x_{it}) \tag{23}$$

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:

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

The model is estimated by using the Simulated Maximum Likelihood technique, that means that I approximate the double integral in equation 22 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):

$$\int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} h_i(c_1, c_2) * \phi_2(c_1, c_2, \rho) dc_1 dc_2 = \frac{1}{R0}\sum_{r=1}^{R0} h_i(c_1^r, c_2^r). \qquad (24)$$

Those bivariate random draws are obtained by extracting R0*2 draws for each of the K individuals from a standard normal distribution[10] 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 $\sqrt{K}$.

[10] 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).

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):

$$\left[\sum_{i=1}^{K} s_i(\widehat{\theta}) s_i(\widehat{\theta})'\right]^{-1} \tag{25}$$

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 median value of the explanatory variables fixing the unobserved heterogeneity at zero, taking derivatives of the likelihood for continuous variables and the first difference between probabilities for the discrete ones. Standard 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, 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"[11] and that only the monetary

[11] Available data refer to the period 1998-2001 and are published in the National Statistical Institute (Istat) website. The Northern area is characterized by the highest percentage of inhabitants aged 65 or more (4 pp. more than in the Southern regions) and a higher number of structures and interventions for elderly and disabled. Roughly

transfers are centralized. In The Netherlands, on the contrary, provisions are rather more uniform across the regions.

Both countries, however, encourage also informal care. From 1995 on, in The Netherlands, the 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 11.3 per cent of the Italian women aged 15-64 is employed in part-time jobs, *versus* 49.1 per cent of the Dutch ones (Eurostat 2005).

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 Netherlands with respect to Italy, the lower for the Netherlands:

- the causal effect of care on work (and *vice versa*), as the reservation

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 last 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.

wage for substituting one hour of care with one hour of work and the opportunity cost of each hour of leisure are lower;

- the role of income on taking informal care decisions, as "basic care needs" can be satisfied by resorting to formal care almost for free and

- the state dependence in informal caring, as productivity improvements in informal care provision, that is a source of state dependency, play no more a role in the decision given that the price of formal care is almost zero.

The easier access to part-time positions that also characterizes the Netherlands (in comparison to Italy) further adds reasons to expect a lower negative causal effect of care on participation and *vice versa,* although the more effective incentives to provide informal care can instead *per se* sort an opposite effect.

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 55 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?" (question PR006, answers 2 and 3). She works if she declares to work in paid employment, to be in training or to be self employed (question PE001, answers 1 to 4).

As independent variables I use: the lagged value of the dummy for care and work, the age and the age squared, dummies for the level of

education[12], dummies indicating the health status[13], the number of children aged less than 16, the yearly non-labour income, the dummy for the ownership of the house, the geographic area of residence (for Italy only: North, Centre or South) 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 thousands of purchasing power parity units. 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 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 (34.4 hours per week *versus* 18.2 hours per week).

In general, participation rates of women who provide care are lower than participation rates of women that do not provide care. Maybe also because care-givers are on average older, less educated, in worse health status and with more children; all characteristics that are usually negatively correlated with labour market participation. The participation rate of women that declare to care is 40.4 per cent among the Italians and 47.5 per cent among the Dutch, *versus* respectively 50.7 per cent and 66.2 per cent of non-carers. While for Italy, the 41 per cent of women that have cared in at least one year in the observed period never worked, in The Netherlands only 26 per cent did (see table 2).

Not only the number of informal care givers is higher among the Italians than among the Dutch - 12 per cent *versus* 8 per cent - but also the average number of hours of care supplied by each individual are higher in Italy than in The Netherlands: 15.1 hours *versus* 13.7 hours. Furthermore Italians provide care for longer periods: among individuals who have cared at least once in the observed period, 41 per cent of the Italians *versus* the 31 per cent of the Dutch care for at least three years (see table 2).

[TABLE 1]

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

[13] Health status is considered "good" if the individual declares to be in a good or very good health condition, "fair" if it declares to be in a fair condition and "bad" otherwise.

As shown in table 3, Italians have a higher probability of starting care activity and a lower probability of exiting from it (5.4 *versus* 4.5 and 45.1 *versus* 48.0). At the same time, they tend to retain their labour market status more permanently than the Dutch. In Italy, 93.3 per cent of women who are observed not to work in t-1, still do not work in t and 93.3 per cent of women observed working in t-1, also work in t. In The Netherlands the status of non-worker persists instead for 82.6 per cent of non-workers and 92.4 per cent of the workers. Specularly, the probability of starting to work for Italian women is lower, 6.7 per cent *versus* 17.4 per cent of Dutch women.

[TABLE 2]

Finally, Italians are more likely to cohabit with the adult in need and to own their house if they are care-givers (see again table 1). Cohabitation involves 42.4 per cent of Italian carers against 16.0 per cent of the Dutch ones and the percentage of care-givers owning their house is almost 81.5 per cent *versus* 76.5 per cent of non-carers and 74.5 of Dutch care-givers. However, care-givers are less rich than non-care givers in both countries, even if such a difference in terms of non-working income is more evident among Italians.

[TABLE 3]

7 Results

Estimation results in tables 4 and 5 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 as shown in section 3.3. 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 apparent.

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 and on the accessibility to part-time positions 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 (a non-working income of 100.000 ppp unities decreases the probability of caring of about 5 pp.), 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 (having cared in the previous year increases the probability of caring of 12.7 pp. in Italy and of 6.9 pp. in The Netherlands). 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 the individual with median characteristics of 46.3 pp. in Italy and of 48.4 per cent in The Netherlands. Unobserved characteristics determining decisions appear to be negatively correlated across the equations in both countries, 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".

[TABLES 4 and 5]

Concerning Italy, estimations further reveal that the probabilities 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, while education plays no role in the caring equation. Differently from what expected, the health status does not significantly reduce neither labour market participation nor caring activity and also the number of children aged less than 16, though being a competing demand of time with respect to any other activity, surprisingly does not play a significant role (perhaps only small children and new born have, see Michaud and Tatsiramos 2005). The non-labour income has, as expected, a negative and significant role in explaining participation, as to confirm that leisure is a normal good: the richer you are, the more you buy it. The ownership of

the house is instead not significant, maybe because very few households rent apartments in Italy. As expected, given the development gap among the Italian regions, living in the South reduces the probability of being employed of 21.7 pp. with respect to living in the Northern regions and of 15.3 pp. with respect to living in the Central regions. It has however no significant effect on the caring choices, pointing out, on one hand, a substantial cultural uniformity among macro-regions, despite the general opinion that looks at the South as still adhering to a cliché of familistic cultural values, and, on the other hand, that the different endowment of public structures and services that characterizes the North with respect to the South seems to play a non relevant role. Finally, the cohort has a significant role in explaining caring choices: younger cohorts care less; it has however no effect on participation. The cohort 1955 has a probability of caring of 2.1 pp. lower than cohort 1945.

Running the regressions on the sample of working age women living in The Netherlands (table 5), further differences between the two countries emerge. The education level counts less in explaining participation, signalling a labour market in which also low-skilled workers have access. The third degree of education increases participation by about 4.4 pp. *versus* 52.5 for Italy. The health status plays a greater role in explaining participation, good health induces an increase in participation by almost 31.7 pp., 7.8 in case of a fair health status. The easy access of Dutch workers to generous invalidity transfers can be at the base of such a result. The presence of children aged less than 16 significantly increases participation (2.4 pp. each child). This result again contradicts the expectation for a negative effect of children on female participation and it can, for example, suggest that if the woman works, the household is richer and can afford to have more children. The income is effective in reducing participation, but its effect is rather small; while the ownership of the house increases it of 4.5 pp., maybe because of mortgage commitments (Bottazzi 2004). Younger cohorts seem to work more, the probability of working for a married woman of the cohort 1955 is about 15.7 pp. greater than for a woman of the cohort 1945.

In the care equation only lagged caring choice, age, good health and children coefficients are significant. Marginal effects are however quite small.

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

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 6. 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[14], the probability of working and caring would increase from 4.5 per cent to 4.9 per cent; the probability of working and not caring would go from 45.2 to 69.7. The predicted probability of caring and not working would go from 6.0 to 2.6. On the contrary, under the Italian policies, the quoted predicted probabilities for the Dutch women would shift respectively from 5.4 per cent to 2.8 per cent, from 67.8 to 35.9, from 2.9 per cent to 6.0.

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.

[TABLE 6]

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 is ill or disabled, some testable policy implications are derived. The more

[14] In simulating the effect of the Dutch policy on Italian women participation and caring activity, the coefficients of the regional dummies are set to zero.

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.

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.

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. 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 few 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. 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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Tables

Table 1 - Descriptive statistics: sample of women aged less then 55 by country and caring activity effort (average values, standard errors in parenthesis)

	Italy		The Netherlands	
	no care	**care**	**no care**	**care**
Frequence	11,176	1,488	7,032	608
Hours of care (per week)	0.0	15.1	0.0	13.7
	(0.0)	*(15.3)*	*(0.0)*	*(14.9)*
Labour market participation	50.7%	40.4%	66.2%	47.5%
	(50.0)	*(49.1)*	*(47.3)*	*(50.0)*
Hours of work (per week; workers only)	35.0	34.4	21.9	18.2
	(10.5)	*(10.4)*	*(11.8)*	*(10.9)*
Age	40	43	40	43
	(6.9)	*(5.8)*	*(6.7)*	*(6.1)*
Level of education				
third level	8.1%	6.5%	10.6%	4.4%
	(27.3%)	*(24.6%)*	*(30.8)*	*(20.6)*
second level	38.4%	37.7%	34.1%	32.1%
	(48.6)	*(48.5)*	*(47.4)*	*(46.7)*
first level o nothing	53.5%	55.8%	55.3%	63.5%
Health				
good	67.2%	56.3%	80.6%	74.2%
	(47.0)	*(49.6)*	*(39.5)*	*(43.8)*
fair	28.7%	37.8%	16.0%	22.2%
	(45.3)	*(48.5)*	*(36.7)*	*(41.6)*
bad or very bad	4.1%	6.0%	3.3%	3.6%
Number of children	2.0	2.2	1.8	2.5
	(1.5)	*(1.6)*	*(1.4)*	*(1.5)*
Income (thousand ppp)	16,957	15,612	20,702	20,593
	(11,750)	*(10,831)*	*(14,018)*	*(18,923)*
Owner	76.5%	81.5%	79.3%	74.5%
	(42.4)	*(38.8)*	*(40.5)*	*(43.6)*
Cohort	6	5	6	5
	(0.6)	*(0.5)*	*(0.6)*	*(0.6)*
Region of residence				
north	29.2%	25.7%		
	(45.5)	*(43.7)*		
center	20.0%	21.8%		
	(40.0)	*(41.3)*		
south	50.8%	52.5%		
Cohabitation with the adult in need	0.0%	42.4%	0.0%	16.0%

Table 2 - Years of work by number of years of caring activity per woman in the observed period (years 1994-2001)

Italy

Years of work if year of care>=1	**Years of care** 1	2	3	4	5	6	7	8	Total	% by year of work
0	640	304	232	208	152	96	96	72	1800	41%
1	104	56	32	16	16	8	24	0	256	6%
2	40	32	32	16	32	0	0	8	160	4%
3	64	8	32	40	32	8	0	0	184	4%
4	112	24	0	0	0	0	8	16	160	4%
5	88	24	16	0	8	0	0	0	136	3%
6	96	0	8	8	0	0	0	0	112	3%
7	80	32	16	24	24	0	0	0	176	4%
8	664	248	192	80	88	56	80	40	1448	33%
Total	1888	728	560	392	352	168	208	136	4432	
% by year of care	43%	16%	13%	9%	8%	4%	5%	3%	100%	

The Netherlands

Years of work if year of care>=1	**Years of care** 1	2	3	4	5	6	7	8	Total	% by year of work
0	184	128	72	40	40	24	16	32	536	26%
1	112	32	16	0	8	8	0	8	184	9%
2	40	16	32	8	24	0	0	8	128	6%
3	80	24	8	0	0	8	0	0	120	6%
4	48	16	8	16	0	8	0	0	96	5%
5	48	48	16	8	0	8	0	0	128	6%
6	72	32	8	0	0	16	0	0	128	6%
7	48	48	16	0	0	0	0	0	112	5%
8	336	120	96	32	0	16	32	16	648	31%
Total	968	464	272	104	72	88	48	64	2080	
% by year of care	47%	22%	13%	5%	3%	4%	2%	3%	100%	

Table 3 - Markovian transition probabilities - women - years 1994-2001

Italy

	no care	*care*
no care	9,243 (94.6%)	524 (5.4%)
care	593 (45.1%)	721 (54.9%)

	no work	*work*
no work	5,230 (93.3%)	373 (6.7%)
work	366 (6.7%)	5,112 (93.3%)

The Netherlands

	no care	*care*
no care	5,886 (95.5%)	280.00 (4.5%)
care	249 (48.0%)	270.00 (52.0%)

	no work	*work*
no work	1,993 (82.6%)	421 (17.4%)
work	326 (7.6%)	3,945 (92.4%)

Table 4 - Base specification with macro area dummies - 8 waves - Italy

		Coeff	Std. Dev.	Z	Mfx	Std. Dev.	Z
Work t>t0	work(t-1)	**1.690**	0.063	26.772	**0.463**	0.039	11.767
	care(t-1)	0.140	0.101	1.379	0.016	0.013	1.255
	age	**0.179**	0.065	2.752	**0.018**	0.008	2.267
	age_squared	**-0.002**	0.001	-2.605	**-0.206** *	0.000	-2.183
	education_ third level	**1.845**	0.171	10.791	**0.525**	0.065	8.074
	education_ second level	**0.828**	0.087	9.477	**0.154**	0.024	6.325
	health status_good	0.156	0.155	1.004	0.014	0.012	1.126
	health status_fair	0.075	0.161	0.467	0.008	0.018	0.440
	# of children	0.028	0.030	0.932	0.003	0.003	0.960
	non-working income (thousands ppp unities)	**-0.010**	0.003	-3.905	**-0.001**	0.000	-3.204
	owner of the house	0.120	0.083	1.444	0.011	0.007	1.466
	cohort	0.210	0.154	1.359	0.021	0.016	1.335
	north	**1.034**	0.143	7.215	**0.217**	0.041	5.266
	center	**0.825**	0.148	5.584	**0.153**	0.038	4.057
	_constant	**-6.881**	1.857	-3.706			
Care t>t0	work(t-1)	-0.114	0.097	-1.181	-0.007	0.006	-1.207
	care(t-1)	**0.884**	0.063	14.034	**0.127**	0.023	5.565
	age	**0.154**	0.057	2.685	**0.010**	0.005	2.158
	age_squared	**-0.002**	0.001	-2.550	**-0.110***	0.000	-2.099
	education_ third level	-0.106	0.121	-0.879	-0.006	0.007	-0.949
	education_ second level	0.113	0.063	1.807	0.008	0.005	1.693
	health status_good	0.047	0.128	0.370	0.003	0.008	0.385
	health status_fair	0.252	0.130	1.929	0.021	0.014	1.524
	# of children	-0.037	0.025	-0.147	-0.246*	1.684*	-0.146
	non-working income (thousands ppp unities)	**-0.007**	0.003	-2.652	**-0.0005**	0.0002	-2.428
	owner of the house	-0.033	0.071	-0.466	-0.002	0.005	-0.458
	cohort	**-0.316**	0.126	-2.498	**-0.021**	0.008	-2.515
	north	-0.099	0.081	-1.229	-0.006	0.005	-1.276
	center	0.036	0.088	0.404	0.002	0.006	0.394
	_constant	**-3.510**	1.728	-2.032			
	σ_{c1}	**1.679**	0.131	12.819			
	σ_{c2}	**0.967**	0.062	15.657			
	ρ_c**	**-0.130**	0.067	-1.958			
	ρ_u**	**-0.240**	0.117	-2.049			
	Log_likelihood	-6769.85					
	Observations	12664					
	Halton draws	60					
	Periods	8					

Note: mfx are the partial effects calculated, on each equation separately, with respect to the median value of the explanatory variables, fixing time invariant error terms to zero. Standard errors are calculated with the Delta Method. σ_{c1} and σ_{c2} are the standard deviations in the equation for work and care respectively. ρ_c and ρ_u** are the correlation coefficients of the unobserved heterogeneity and of the time variant error component of the periods from the second on. Coefficients significant at the 5 per cent level in bold.
*multiplied by 1000
**Standard errors and Z-statistics are referred to the inverse of the hyperbolic tangent

Table 5 - Base specification - 8 waves – The Netherlands

		Coeff	Std. Dev.	Z	Mfx	Std. Dev.	Z
Work t>t0	work(t-1)	**1.494**	0.060	24.725	**0.484**	0.029	16.879
	care(t-1)	-0.190	0.113	-1.687	-0.038	0.025	-1.504
	age	**0.237**	0.063	3.752	**0.041**	0.012	3.578
	age_squared	**-0.002**	0.001	-2.611	**-0.352***	0.000	-2.639
	education_ third level	**0.308**	0.122	2.527	**0.044**	0.016	2.699
	education_ second level	0.051	0.084	0.609	0.009	0.014	0.610
	health status_good	**1.072**	0.159	6.741	**0.317**	0.065	4.892
	health status_fair	**0.724**	0.166	4.353	**0.078**	0.015	5.237
	# of children	**0.136**	0.035	3.833	**0.024**	0.007	3.179
	non-working income (thousands ppp unities)	**-0.006**	0.001	-5.151	**-0.001**	0.000	-4.541
	owner of the house	**0.225**	0.094	2.393	**0.045**	0.021	2.150
	cohort	**0.896**	0.190	4.730	**0.157**	0.044	3.568
	_constant	**-12.919**	2.149	-6.012			
Care t>t0	work(t-1)	-0.217	0.119	-1.824	-0.008	0.005	-1.680
	care(t-1)	**0.875**	0.106	8.269	**0.069**	0.021	3.235
	age	**0.159**	0.079	2.022	0.005	0.003	1.881
	age_squared	-0.002	0.001	-1.937	-0.050*	0.029*	-1.714
	education_ third level	-0.144	0.163	-0.884	-0.004	0.004	-0.944
	education_ second level	-0.008	0.103	-0.077	-0.235*	3.050*	-0.077
	health status_good	**0.387**	0.197	1.966	**0.007**	0.003	2.823
	health status_fair	**0.513**	0.203	2.531	0.027	0.017	1.614
	# of children	**0.140**	0.037	3.783	**0.004**	0.001	3.801
	non-working income (thousands ppp unities)	0.000	0.002	-0.082	-0.005*	0.056*	-0.082
	owner of the house	-0.108	0.101	-1.064	-0.004	0.004	-0.978
	cohort	-0.060	0.240	-0.249	-0.002	0.007	-0.243
	_constant	-5.789	2.931	-1.975			
	σ_{c1}	**1.058**	0.086	12.272			
	σ_{c2}	**0.874**	0.087	9.993			
	ρ_c**	**-0.220**	0.097	-2.351			
	ρ_u**	0.102	0.226	0.451			
	Log_likelihood	-4280.885					
	Observations	7640					
	Random draws	60					
	Periods	8					

Note: mfx are the partial effects calculated, on each equation separately, with respect to the median value of the explanatory variables, fixing time invariant error terms to zero. Standard errors are calculated with the Delta Method. σ_{c1} and σ_{c2} are the standard deviations in the equation for work and care respectively. ρ_c and ρ_u** are the correlation coefficients of the unobserved heterogeneity and of the time variant error component of the periods from the second on. Coefficients significant at the 5 per cent level in bold.
*multiplied by 1000
**Standard errors and Z-statistics are referred to the inverse of the hyperbolic tangent

Table 6 – Joint probabilities observed, predicted and simulated applying the other country policies

	Italy			The Netherlands		
	Observed	Predicted	As Dutch	Observed	Predicted	As Italian
joint probability of working and caring	4.30%	4.52%	4.88%	5.13%	5.35%	2.80%
joint probability of working and not caring	45.48%	45.24%	69.67%	65.13%	67.81%	35.90%
joint probability of caring and not working	6.70%	5.95%	2.64%	4.19%	2.90%	5.97%

Appendix: Estimations of the initial conditions

Table A1 – Base specification with macro area dummies - Initial condition - Italy

			Coeff	Std. Dev.	Z
Work t0	age		0.066	4.689	0.014
	age_squared		-0.001	0.002	-0.496
	education_ third level		**1.896**	0.298	6.361
	education_ second level		**1.133**	0.165	6.874
	health status_good		0.217	0.287	0.754
	health status_fair		0.222	0.299	0.741
	# of children		0.035	316228	0.000
	non-working income (thousands ppp unities)		**-0.019**	0.007	-2.880
	owner of the house		**0.348**	0.133	2.619
	cohort		-0.099	46.783	-0.002
	north		**1.334**	0.219	6.083
	center		**1.013**	0.215	4.702
	_constant		-2.170	440.057	-0.005
Care t0	age		0.040	3.762	0.011
	age_squared		0.000	0.001	-0.074
	education_ third level		0.045	0.189	0.239
	education_ second level		0.021	0.113	0.189
	health status_good		-0.356	0.229	-1.553
	health status_fair		-0.209	0.236	-0.887
	# of children		-0.019	316228	0.000
	non-working income (thousands ppp unities)		-0.002	0.004	-0.422
	owner of the house		**0.246**	0.121	2.041
	cohort		-0.300	37.651	-0.008
	north		-0.099	0.123	-0.811
	center		-0.041	0.137	-0.297
	_constant		-0.825	353.762	-0.002
	ρ_e**		-0.043	0.056	-0.767
	Heckman terms	λ_1	**1.252**	0.139	9.019
		λ_2	0.050	0.108	0.463
		λ_3	0.051	0.046	1.103
		λ_4	**0.888**	0.112	7.916

Note: ρ_e is the correlation coefficient of the time variant error component of the first period. Lambda's are the coefficients of the Heckman initial conditions. Coefficients significant at the 5 per cent level in bold.
*multiplied by 1000
**Standard errors and Z-statistics are referred to the inverse of the hyperbolic tangent

Table A2 - Base specification – Initial condition – The Netherlands

			Coeff	Std. Dev.	Z
Work t0	age		-0.208	6.134	-0.034
	age_squared		**0.005**	0.002	3.109
	education_ third level		**0.751**	0.221	3.392
	education_ second level		**0.361**	0.165	2.187
	health status_good		0.132	0.374	0.353
	health status_fair		-0.006	0.404	-0.016
	# of children		0.116	316228	0.000
	non -working income (thousands ppp unities)		**-0.016**	0.005	-3.235
	owner of the house		0.190	0.153	1.243
	cohort		1.683	61.184	0.028
	_constant		-8.919	575.441	-0.015
Care t0	age		0.055	4.746	0.012
	age_squared		0.000	0.003	-0.054
	education_ third level		-0.975	0.539	-1.810
	education_ second level		-0.111	0.263	-0.423
	health status_good		-0.355	0.539	-0.659
	health status_fair		-0.710	0.649	-1.095
	# of children		0.077	316228	0.000
	non-working income (thousands ppp unities)		-0.035	0.016	-2.141
	owner of the house		-0.004	0.241	-0.017
	cohort		-0.361	47.652	-0.008
	_constant		-1.058	447.373	-0.002
	ρ_e**		-0.074	0.069	-1.075
	Heckman terms	λ_1	**1.291**	0.172	7.496
		λ_2	-0.113	0.133	-0.851
		λ_3	-0.113	0.164	-0.693
		λ_4	**1.336**	0.321	4.161

Note: ρ_e is the correlation coefficient of the time variant error component of the first period. Lambda's are the coefficients of the Heckman initial conditions. Coefficients significant at the 5 per cent level in bold.
*multiplied by 1000
**Standard errors and Z-statistics are referred to the inverse of the hyperbolic tangent