Disability and Low Income Persistence in Italian Households

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DISABILITY AND LOW INCOME PERSISTENCE IN ITALIAN HOUSEHOLDS

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ABSTRACT

We apply dynamic probit models allowing for unobserved heterogeneity and endogenous initial conditions to IT-SILC data to investigate the low income persistence of households with disabled members. We find that their probability of being in a low income state is higher when compared with households without disabled members. In both cases household head's characteristics, as employment status and education, contribute to determine low income positions. Our results also support the hypothesis of endogenous initial conditions. Both unobserved heterogeneity and state dependence are important to determine low income positions. Our findings suggest that a structural intervention geared at lifting households out of low income in future requires to get them out of low income at present. Moreover, preventing rather than rescuing actions are preferable.

Keywords: Persistence, disability, dynamic probit model, initial conditions.

JEL codes: J14, I32, C23.

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INTRODUCTION

Disability has been coming to the forefront of Governments' and international organizations interest in the latest 10 years. 2003 was named by the EU as the European Year of People with Disabilities, and in October 2003 the European Disability Action Plan (2003-2010) was launched, with the objective of enhancing the employment of disabled persons, of "mainstreaming disability issues across all EU policies, legislation and programmes, taking into account their design, implementation, monitoring, and evaluation", and of improving accessibility. The United Nations Convention on the Rights of Persons with Disabilities was voted on December 6, 2006, with the ultimate objective to 'boost equal opportunities for people with disabilities' so as to create a 'sustainable dynamic for the full inclusion of people with disabilities into society". In all these documents the fundamental rights of living a not deprived life for disabled people is mentioned, with respect to income, social life, and participation in community life.

Despite the widespread interest on disability, not much is known about how disability affects the conditions of households with disabled persons (HHD), either in terms of multidimensional inclusion into society, or in financial terms; in particular, whether HHD are at a higher risk of poverty than households with not disabled persons (HHND). The limited literature on the subject indicates special situations with respect to poverty among HHD compared with HHND (Fremstad (2009), Parodi and Sciulli (2008), She and Livermore (2007and 2009), Tibble (2005). However, one aspect which has been overlooked by this literature is the comparative poverty persistence of the two groups.

The literature may differ according to the definition of persistence[3] adopted. In this context we refer to Cappellari and Jenkins (2002a and 2002b), Jenkins (2000), Poggi (2007), Whelan and Layte and Maitre (2001), Trivellato and Giraldo and Rettore (2002). Here we investigate persistence estimating whether the probability of low income[4] in one period is affected by low income in the previous period[5]. The analysis of persistence is important for its policy implications. If the results of the analysis show that the probability of having a low income is mainly explained by structural factors, i.e. idiosyncratic characteristics, environmental/educational factors, and that past history of low income is irrelevant (either hardly significant or significant but very small), then policy

[3] Income mobility is not quite specular to persistence. Indexes are constructed to measure persistency and income mobility.

[4] Low income is here defined in terms of equivalent income belonging to the first three deciles.

[5] Note that in what follows history goes back one step only. Probably, should more steps be taken into account, the explicative power of past history would be enhanced.

implications suggest to work on structural characteristics, i.e. to improve education, work opportunities, environment. If however past history of low income, i.e. the lag dependent variable included among controls (state dependence), is significant and relevant in magnitude then policy implications are very different: a massive effort has to be made in order to lift the individual out of low income, as the very fact of being in low income increases the probability of low income the following period. The policy recommended by these findings suggest money transfers and/or provision of consumption goods[6] sufficient to get the individual out of low income.

However, this conclusion based on the role of persistency in explaining the probability of being in low income has to be drawn with much caution. In fact, even though money transfer temporarily lifts the individual out of low income, it could be ineffective in the medium-long term to fight poverty status. Specifically, if money transfers leave unchanged structural characteristics determining low income positions, they would be needed repeatedly, in each period, in order to keep the individual out of low income, and they can be interpreted as compensation for the lack of suitable structural characteristics.

In purely efficiency terms, repeated money transfers or transformations of the initial conditions would be indifferent to society as instruments to lift individuals out of low income, under the condition that the present value of the flow of money transfers equals the present value of the flow of costs needed to alter the structural characteristics. Of course the amount of money transfers necessary each period to keep individuals out of low income depends on the shape of the income distribution, i.e. on the level and frequency of low incomes. Conversely, the cost of intervention on structural characteristics depends on the distribution of the structural characteristics themselves, i.e. on the level and frequency of the characteristics below the levels needed to lift the individual out of low income[7]. The problems just outlined are interesting from a methodological point of view, and become crucial when comparing the probability of low income for different groups, in order to investigate the factors which determine low income, and the consequent policy recommendations.

[6] In this case very special attention ought to be paid to the different consumption and service needs of HHD and HHND. Even though this topic has been little investigated, on the specific consumption specifications of HHD see Tibble (2002), Zaidi and Burchardt (2003)

[7] The conclusion would be different if we studied social exclusion in terms of durable goods, such as for instance housing. An estimated persistence in terms of the lagged variable "quality of housing" would recommend the policy of providing the individual with a good house, as this once and for all the intervention would lift the individual out of social exclusion in terms of poor housing.

This paper develops a dynamic approach to estimate the factors which affect the probability of being in low income separately for households with and without members with disabled people, with special focus on the role of persistence. Specifically, our benchmark model consists in a dynamic probit model taking into account unobserved heterogeneity and true state dependence. Econometric analysis is based on the longitudinal section of the IT-SILC database for the period 2004-2007. IT-SILC allows us to identify disabled people on the basis of self-reported information about limitation in activities because of health problems. For robustness purposes alternative definitions of disability, according to the seriousness and the time of activity limitations, are considered.

According to our estimation results, whatever model is used, low income position is strongly dependent on the previous low income status, even though not taking into account the initial condition problem seriously overestimates the state dependence parameter. In this context, HHD, compared with HHND, are more likely to be in low income positions and experience a stronger persistence in that state, i.e. they have a greater difficulty in leaving low income status once they are there. As anticipated this has policy implications. When significant, familiar and head characteristics quite similarly affect the probability of being in low income positions of HHD and HHND, with the exception of education, employment and marital status of household heads. Policy implications of our findings are discussed in the last paragraph.

The remainder of this paper is organized as follows. Section 2 describes the data. Section 3 provides the empirical specification, while Section 4 presents the results of the econometric analysis. Finally, conclusions and policy implications follow in Section 5.

DATA

Two concepts need clarification before moving forward, the first concerns the definition of disability, the second concerns the definition of persistence of low income.

The definition of disability can be tackled from several angles: the first one is based on the International Classification of Functioning, Disability and Health (ICF, WHO, 2001), which identifies the social or inclusive model of disability, based on the capability approach. In this respect disabled is the person whose autonomy is limited because of the characteristics of the context where she lives and operates (this is the approach advocated by the European Disability Forum). An alternative approach is the strictly institutional one, according to which disabled are considered the people whom the institutional system has certified as such, and who receive some

kind of disability benefits. A third approach is the self referential one, according to which disabled is the person who considers herself as such when answering specific questions about health, often referring to limitations encountered in daily activities. The three definitions have all pros and cons: in particular the second one is open to bias determined by fraud, or by governmental choice of using disability benefits as an instrument of financial support to poor people; the third is contingent on the possible bias linked to self assessment, but also is flexible enough to accommodate for different individual perceptions to given limitations. Consequently, the choice of using data collected according to each system introduces some bias in the investigation; the EU-SILC data which are suitable for our investigation have not a specific question to identify disability, therefore we infer a definition of disability from how people perceive their own imitations.

A second reflection concerns the definition of low income, here identified by levels of equivalent income belonging to the first three deciles; the upper limit therefore coincides with 60% of the median, which identifies the poverty line according to Eurostat methodology.

Our analysis is based on the longitudinal section of the IT-SILC dataset for the period 2004-2007. The IT-SILC data is the Italian component of the EU-SILC (the European Union Statistics on Income and Living Conditions) that is an instrument aimed to provide cross-sectional and longitudinal information. The EU-SILC collects micro-data on income, poverty, social exclusion and living conditions from most of the EU countries in order to make available comparable information across countries. As the EU-SILC, the IT-SILC is a multi-purpose instrument mainly focusing on income, and devoting specific attention to detailed income components both at household and personal level, social exclusion, housing condition, labour, education and health.

The IT-SILC dataset includes about 105000 individuals and about 49000 households for the whole period 2004-2007. However, since our dynamic analysis requires a balanced panel, we only use information from households present in each of the four waves of the longitudinal section. This selection leaves us with 4502 households. The income of households with a different number of components is made comparable using the modified OECD equivalent scale, for which the household income is normalized by an equivalent scale number (equivalent adult) that assigns different weights for each household component[8]. Disabled individuals, to single out households without disabled members from households with disabled members, are identified using information about limitations in activities because of health problems. This variable identifies three levels of limitation: no limitation, limitation and strong limitation. Moreover, the level of limitation,

[8]According to the modified OECD equivalent scale used here, the equivalent adult is: ae=1+0.5*(adults-1)+0.3*(number of components aged less than 14). The equivalent income is $Y_{eq}=Y/ae$.

even though quite stable across years, may change overtime. Given these introductions we define the HHD for the whole period under investigation, as the household in which at least one member reports at least two years of strong limitations in activities and at least one year of limitation in activities. Other households are defined without disabled members (HHND). Table 1 reports the number of households by combination of level of limitation across years, and identifies HHD.

Table 1. Identification of HHD and HHND

Number of years with limitation		Weak Limitation				
		0	1	2	3	4
Strong Limitation	0	1804	620	339	255	123
	1	112	105	153	114	-
	2	51	79	124	-	-
	3	46	140	-	-	-
	4	137	-	-	-	-

Source: our elaboration on IT-SILC data

This definition of disability leaves us with 640 households with disabled members and 3562 households without disabled members[9].

Low income position is defined as the presence in the first three deciles of the equivalent income distribution. The dynamic process in the low income positions is explained in terms of household characteristics and of personal characteristics of the reference person. Specifically, we consider the area of residence, the number of household components and the presence of children aged 0-5 at household level, the age, gender, educational level, employment status and the marital status at personal level. Descriptive statistics are reported in table 2.

[9] For robustness check we also use two alternative identification of HHD. The weaker definition includes as HHD those households for which at least one member declare to experience at least 3 years of limitations in activities. According to this definition we identify 1171 HHD and 3031 HHND. The stronger definition identifies HHD by the presence of at least one household member declaring four years of limitations in activities (two of which strong limitations). According to this definition we identify 401 HHD and 3801 HHND. Estimation results obtained from these alternative definitions are presented in the appendix.

Table 2. Descriptive statistics

	HHD		HHND	
Covariates	Mean	Std. Dev.	Mean	Std. Dev.
Low income position	0.355	0.479	0.290	0.454
Age 16-29	0.063	0.242	0.133	0.339
Age 30-44	0.094	0.292	0.307	0.461
Age 45-60	0.164	0.371	0.266	0.442
Age over 60	0.680	0.467	0.295	0.456
Male	0.445	0.497	0.499	0.500
Maximum low education	0.772	0.420	0.552	0.497
Secondary education	0.147	0.354	0.299	0.458
Minimum post-secondary education	0.052	0.221	0.135	0.342
Missing education	0.030	0.170	0.013	0.115
North	0.400	0.490	0.489	0.500
Centre	0.256	0.437	0.219	0.413
South-Islands	0.344	0.475	0.292	0.455
Employed	0.183	0.387	0.492	0.500
Partner employed	0.147	0.354	0.335	0.472
Change in disability status	0.378	0.485	0.055	0.228
Disabled in the first wave*	0.895	0.306	0.154	0.361
Married/Cohabitant	0.534	0.499	0.600	0.490
Children 0-5	0.038	0.228	0.145	0.415
HH size	2.384	1.182	2.635	1.264
Urban area*	0.269	0.444	0.320	0.467
* Initial state equation				

Source: our elaboration on IT-SILC data

Table 3 shows the transition matrices across the income deciles from time t and time t+1, comparing the situation of HHD and HHND. Clearly, HHD experiment higher persistence in the departure decile, whatever it is. With respect to the situation of HHND, the persistence rate of HHD is particularly relevant in the second and third deciles, implying that HHD are likely to experiment stronger persistence in low income positions than HHND. This may also e explained by the presence of disabled members in those households.

Table 3. Transition matrices

HOUSEHOLDS WITH DISABLED MEMBERS										
	1	2	3	4	5	6	7	8	9	10
1	**64.17%**	13.37%	8.56%	7.49%	2.67%	0.53%	0.53%	1.60%	1.07%	0.00%
2	13.10%	**63.89%**	9.92%	7.94%	2.78%	1.19%	0.40%	0.79%	0.00%	0.00%
3	8.30%	9.13%	**55.19%**	13.69%	7.47%	2.90%	1.66%	0.83%	0.41%	0.41%
4	7.14%	5.56%	11.11%	**52.38%**	10.71%	7.14%	3.57%	1.59%	0.79%	0.00%
5	3.13%	5.80%	5.80%	13.39%	**50.00%**	9.82%	5.80%	2.23%	3.13%	0.89%
6	0.53%	1.59%	4.23%	4.76%	15.87%	**44.44%**	15.34%	8.47%	3.70%	1.06%
7	1.23%	2.45%	3.07%	2.45%	6.75%	14.11%	**41.10%**	18.40%	6.75%	3.68%
8	0.00%	0.58%	1.73%	3.47%	4.05%	7.51%	14.45%	**44.51%**	17.34%	6.36%
9	0.72%	0.72%	2.16%	5.76%	1.44%	2.88%	5.76%	15.83%	**52.52%**	12.23%
10	0.00%	1.00%	2.00%	0.00%	5.00%	1.00%	3.00%	7.00%	18.00%	**63.00%**
HOUSEHOLDS WITHOUT DISABLED MEMBERS										
	1	2	3	4	5	6	7	8	9	10
1	**61.87%**	15.77%	8.34%	4.67%	3.48%	2.84%	0.73%	0.73%	0.64%	0.92%
2	16.10%	**51.91%**	15.49%	5.33%	5.13%	2.62%	1.01%	1.31%	0.60%	0.50%
3	7.07%	12.97%	**43.61%**	16.01%	8.06%	5.80%	3.34%	1.57%	1.08%	0.49%
4	5.26%	5.06%	15.87%	**41.27%**	14.58%	7.34%	5.26%	2.58%	1.79%	0.99%
5	3.09%	4.92%	5.60%	13.71%	**38.61%**	15.83%	8.30%	5.69%	2.61%	1.64%
6	2.79%	3.17%	4.10%	7.45%	14.80%	**35.75%**	17.32%	8.01%	4.56%	2.05%
7	1.37%	1.46%	3.01%	3.92%	6.93%	15.50%	**37.10%**	18.51%	7.47%	4.74%
8	1.01%	1.20%	1.47%	2.76%	4.23%	7.82%	17.39%	**35.79%**	19.87%	8.46%
9	1.25%	0.53%	1.16%	1.43%	1.96%	4.81%	7.66%	19.43%	**42.96%**	18.81%
10	1.21%	0.78%	0.95%	0.86%	1.29%	3.45%	3.54%	6.38%	18.21%	**63.33%**

Source: our elaboration on IT-SILC data

THE ECONOMETRIC MODEL

The low income position is defined as the presence in the first three deciles of the equivalent household income distribution. The evolution overtime of the presence in low income positions is investigated by applying a dynamic probit model accounting for both unobserved heterogeneity and state dependence. Overall, the introduction of the lagged dependent variable among the covariates allows us to identify the existence and the magnitude of the persistence phenomenon in a low income position. Moreover, since we are interested in comparing the situation of households with and without disabled members we consider separately the two groups of households, and apply the model to each group.

The equation for the latent dependent variable is:

$$(1)\quad y_{it}^{*} = \gamma y_{it-1} + x_{it}^{'}\beta + \alpha_i + u_{it}$$

with i=1,…,N indicating the households and t=2,…,T the time periods. y_{it}^{*} is the latent dependent variable and y_{it} is the observed binary outcome variable defined as:

$$(2)\quad y_{it} = \begin{cases} 1 & \text{if } y_{it}^{*} \geq 0 \\ 0 & \text{else} \end{cases}$$

and where x_{it} is a vector of explanatory variables and the error terms u_{it} are assumed to be? serially independent and normally distributed with zero mean and variance σ_u^2. However, given the presence of the individual specific time invariant α_i terms, the composite error term, $v_{it} = \alpha_i + \sigma_u^2$, is correlated over time. Specifically, equi-correlation between the v_{it} in any two different time periods reads:

$$(3)\quad \rho = Corr(v_{it}, v_{is}) = \frac{\sigma_\alpha^2}{\sigma_\alpha^2 + \sigma_u^2} \qquad t,s=2,\ldots,T;\ t \neq s$$

Standard model estimation requires that initial observations (y_{i1}) and unobserved heterogeneity (α_i) are uncorrelated. However, the assumption of exogenous "initial conditions" is likely tnot to hold in case the starting point of the process governing the outcomes is not observed. If this is the case, it is not possible to observe whether the starting low income position of households is the result of state dependence or unobserved heterogeneity. To solve the initial conditions problem, taking into account the correlation between y_{i1} and α_i, Heckman (1981) suggested the use of an approximation to the process generating the first period observations using the same form of equation as for the rest of the observations but with some restrictions. Specifically, the linearized reduced form equation for the initial value of the latent variable may be expressed as:

$$(4)\quad y_{i1}^{*} = z_{i1}^{'}\pi + \eta_i$$

where z_{i1} is a vector of exogenous instruments and η_i is correlated with α_i, but uncorrelated with u_{it} for $t \geq 2$. It can be written as:

$$(5)\quad \eta_i = \theta\alpha_i + u_{i1}$$

where $\theta > 0$, and with u_{it} and α_i independent of one another. The linearized reduced form for the latent variable for the initial time period is therefore specified as:

(6) $y_{i1}^{*} = z_{i1}^{'}\pi + \theta\alpha_i + u_{i1}$

where z includes period 1 values of x variables, typically together with pre sample variables as instruments.

The joint probability of the observed binary sequence for individual i, given the unobserved heterogeneity term, is:

(7) $\Phi\left[\left(z_{i1}^{'}\pi + \theta\alpha_i\right)\left(2y_{i1} - 1\right)\right]\prod_{t=2}^{T}\Phi\left[\left(\gamma y_{it-1} + x_{it}^{'}\beta + \alpha_i\right)\left(2y_{it} - 1\right)\right]$

It follows that the likelihood function to be maximized reads:

(8) $L = \prod_i \int_{\alpha/\sigma_\alpha} \Phi\left[\left(z_{i1}^{'}\pi + \theta\alpha_i\right)\left(2y_{i1} - 1\right)\right]\prod_{t=2}^{T}\Phi\left[\left(\gamma y_{it-1} + x_{it}^{'}\beta + \alpha_i\right)\left(2y_{it} - 1\right)\right] dF\left(\alpha/\sigma_\alpha\right)$

where F is the distribution function of α/σ_α, where $\sigma_\alpha = \sqrt{\rho/(1-\rho)}$. If α is normally distributed, then the integral over α/σ_α can be evaluated using Gaussian-Hermite quadrature.

ESTIMATION RESULTS

Table 4 reports the estimation results obtained by applying dynamic probit models. The first two columns refer to the model assuming exogenous initial conditions, while third and fourth columns report the estimation results of the model taking into account the possibility of endogenous initial conditions. We now analyze the results which are common to both HHD and HHND, and subsequently we bring out the differences between the two groups.

Table 4. Low income persistence: dynamic probit models

	Model 1						Model 2					
	HHD			HHND			HHD			HHND		
	Coef.	s.e.		Coef.	s.e.		Coef.	s.e.		Coef.	s.e.	
Lag low income position	2.109	0.078	***	1.896	0.034	***	1.223	0.203	***	1.072	0.077	***
Age 16-29	-0.200	0.216		-0.016	0.065		-0.328	0.267		-0.022	0.087	
Age 45-60	-0.086	0.169		-0.178	0.049	***	-0.231	0.225		-0.236	0.069	***
Age over 60	-0.284	0.169	*	-0.344	0.058	***	-0.379	0.220	*	-0.349	0.080	***
Male	-0.158	0.079	**	-0.094	0.034	***	-0.174	0.100	*	-0.116	0.045	***
Max. low education	0.221	0.119	*	0.328	0.041	***	0.327	0.162	**	0.522	0.060	***
Min. Post-secondary education	-0.714	0.232	***	-0.137	0.057	**	-0.829	0.291	***	-0.167	0.077	**
Missing education	-0.001	0.324		0.780	0.281	***	-0.034	0.397		0.909	0.340	***
North	0.084	0.099		-0.047	0.044		0.129	0.161		-0.130	0.070	*
South-Islands	0.315	0.100	***	0.373	0.046	***	0.658	0.179	***	0.790	0.087	***
Employed	0.049	0.117		-0.451	0.040	***	-0.054	0.151		-0.654	0.056	***
Partner employed	-0.384	0.148	***	-0.477	0.045	***	-0.645	0.211	***	-0.711	0.064	***
Change disability status	-0.048	0.078		0.033	0.068		-0.018	0.093		0.069	0.087	
Married/coabitant	0.207	0.091	**	0.012	0.043		0.293	0.131	**	-0.016	0.063	
Children 0-5	-0.277	0.216		0.229	0.046	***	-0.272	0.267		0.407	0.069	***
Household size	-0.073	0.047		-0.034	0.018	*	-0.177	0.076	**	-0.072	0.027	***
Constant	-1.130	0.229	***	-0.954	0.076	***	-0.864	0.317	***	-0.860	0.111	***
Sigma u	0.000	0.004		0.001	0.005							
Rho	0.000	0.000		0.000	0.000		0.520	0.135	***	0.507	0.047	***
LR test of rho=0												
chibar2(1)	0.000			0.001			67.29			374.25		
Prob>=chibar2	1.000			0.490			0.000			0.000		
Theta							1.759	0.759	**	1.405	0.184	***
Number of observations	1915			10648			2560			14248		
Number of households	640			3562			640			3562		
Wald chi2(16)	841.65			4157.60			191.66			1453.72		
Prob > chi2	0.000			0.000			0.000			0.000		
Log likelihood	-700.90			3562.00			-1044.05			-5248.98		

Source: our elaboration on IT-SILC data

First, we examine the estimates of persistence as a factor determining the probability of being poor: the estimates of the dynamic probit (model 1) shows that for both groups the probability of being in low income is mainly and positively affected by low income in the previous period. This is seen by the positive sign, the high statistical significance and the value of the estimated coefficient of the delayed variable. However, the coefficient of the lagged variable is higher for HHD than for HHND: low income history has a stronger impact on the probability of present low income for HHD than for HHND.

The estimates of the dynamic probit which takes into account initial conditions (model 2) confirm the strong explanatory power of low income persistence for both groups; however, the

estimated coefficient of the lagged variable is smaller, and the estimated coefficients of the structural variables are higher in model 2 than in model 1.

We now compare the estimates of the effects of the structural variables on the probability of low income for the two groups, households without and with disabled members; it is important to remark that almost all structural variables have the same sign for both groups.

Two variables have an equally significant and high coefficient to explain the probability of low income for both group: living in the South-Islands highly increases the probability of low income; on the contrary, the employment of the household partner highly decreases the probability of low income, even though slightly less for HHD. Policy implications follow: the South-Islands are the areas of the country with the highest levels of diffusion and intensity of poverty, and high unemployment, therefore policies to improve the situation in these areas would reduce the chances of low income for both groups here considered. Also, the provision of caring services for young children and disabled people would allow the household partner to take part in some form of paid employment. Also the head's education is important to explain the probability of being in low income state. For both groups, with respect to the base-category, the secondary educational level, being less educated increases the probability of being in low income, while having more education decreases that probability. However, returns differ quite strongly between HHD and HHND. Being poorly educated is more penalizing for HHND while being highly educated is more profitable for HHD: definitely the return of household head's education is higher for HHD than for HHND. Finally, the household head's age has similar effects for both HHD and HHND, even though significance does differ.

We now comment on variables significant for one group but not for the other. The estimates of a group of three variables have to be interpreted together, i.e. the status of employment of the household head, the age of the household head. For HHD the probability of poverty is significantly reduced if the Household head is employed, and of central age, and both these findings are intuitive; however, both these variables are insignificant for HHND. The presence of small children is highly significant among HHND to increase the probability of being poor, but it is not significant at all for HHD. We can explain this in terms of the reduced opportunity to work in paid employment of the household head's partner when the spouse is needed to look after a severely disabled person. As a consequence, if in HHD household resources are already used to look after a severely disabled person, the marginal use of resources needed to look after a young child is negligible, so the impact of a young child on the household income is not significant for HHD. In the opposite direction, being married/cohabitant significantly increases the probability of being poor for HHD, and is

insignificant for HHND. This can be explained: if the spouse stays at home to look after the disabled person, a given income has to support at least two people, so increasing the probability of being poor. Other variables are differently significant in the two groups. The probability of low income is reduced with the increase in household size for HHND, for whom the economy of scale effect can be expected to prevail; however for HHD economies of scale appear to be less relevant, as they are more than countervailed by the likely high fixed expenditures connected with the presence of the disabled member.

POLICY IMPLICATIONS AND CONCLUDING REMARKS.

We list the findings which we believe to be most relevant for policy implications.

1. The probability of low income is higher for HHD.
2. Estimated persistence is higher for HHD than for HHND; if the econometric analysis is refined to consider endogenous initial conditions, the coefficient estimating the persistence effect is still positive and significant for both groups, but the gap in the two coefficients is slightly smaller; persistence is important to explain low income, and more so for HHD than for HHND.

These findings suggest that a structural intervention geared at lifting households out of low income in future requires to get them out of low income at present. Also, from the estimates we can infer that present low income has a bigger role in explaining the probability of low income in the future for HHD than for HHND.

However, the explanatory power of persistence decreases when the initial conditions are taken into account, and structural variables acquire a stronger explanatory role.

The consequent recommendation for policy is to act before the individual falls into poverty, so that persistence does not add its effects to keep the individual in poverty.

3. The variable with a strong significance in reducing poverty for HHD is the employment of the household's partner. The consequent recommendation for policy is the provision of adequate caring services to look after the disabled person, in order to allow the household partner to work in paid employment.
4. Household size is a factor determining the reduction in the probability of low income, when initial conditions are taken into account; this suggests the importance of economies of scale, and of sharing the tasks of caring for the disabled person, so that none of the household member has to give up all forms of paid employment in order to care for the disabled person. The consequent

recommendation for policy is the same mentioned above, i.e. provision of adequate caring services to allow all household members some form of paid employment.

5. Last, among the explanatory variables, fewer are the variables significant for HHD than for HHND, showing that HHD are less respondent to external circumstances. This appears to indirectly confirm social exclusion of HHD, whose interaction with the world appears to be much less significant than for HHND.
6. Our findings also show that preventive and rescuing policy interventions are not equally effective/symmetric with respect to fighting poverty; and they also recommend early interventions, to prevent people from falling into poverty, rather than late interventions, to lift poor people out of poverty. This emerges from our findings: the probability of low income is affected more by structural variables if we take into account the initial conditions; therefore the effectiveness of policy instruments working on structural variables is stronger if the persistence element is not there. Once the individual is in a state of low income, policy interventions have to work on the structural variables, but also on the increase in the probability of low income that persistence creates. Therefore preventing rather than rescuing actions are recommended.

APPENDIX

Table A1. Determinants of the initial low income state: probit models

	HHD			HHND		
	Coef.	s.e.		Coef.	s.e.	
Age 16-29	0.369	0.498		0.246	0.136	*
Age 45-60	-0.752	0.480		-0.205	0.114	*
Age over 60	-0.673	0.461		-0.231	0.135	*
Male	0.058	0.203		-0.239	0.077	***
Max. low education	0.721	0.316	**	0.683	0.100	***
Min. Post-secondary education	0.358	0.586		-0.148	0.140	
Missing education	1.501	0.674	**	0.561	0.333	*
North	0.030	0.292		-0.171	0.108	
South-Islands	0.704	0.337	**	0.931	0.124	***
Employed	-0.688	0.335	**	-0.660	0.094	***
Partner employed	-0.788	0.354	**	-0.709	0.104	***
Change disability status	-0.548	0.352		0.028	0.100	
Married/coabitant	0.233	0.263		0.030	0.101	
Children 0-5	0.510	0.429		0.326	0.105	***
Household size	-0.343	0.152	**	-0.015	0.041	
Densely populated area	-0.377	0.237		-0.225	0.081	***
Constant	0.308	0.713		-0.844	0.183	***

Source: our elaboration on IT-SILC data

Table A2. Weak definition of disability (at least 3 years of limitations)

	HHD			HHND			HHD			HHND		
	Coef.	s.e.		Coef.	s.e.		Coef.	s.e.		Coef.	s.e.	
Lag low income position	**2.099**	0.057	***	**1.853**	0.037	***	**1.016**	0.127	***	**1.075**	0.087	***
Age 16-29	-0.172	0.153		0.001	0.068		-0.358	0.205	*	0.015	0.090	
Age 45-60	-0.235	0.119	**	-0.160	0.051	***	-0.329	0.173	*	-0.208	0.070	***
Age over 60	-0.356	0.121	***	-0.359	0.062	***	-0.391	0.173	**	-0.383	0.085	***
Male	-0.098	0.059	*	-0.105	0.037	***	-0.137	0.083	*	-0.128	0.047	***
Max. low education	0.281	0.089	***	0.321	0.043	***	0.453	0.133	***	0.494	0.062	***
Min. Post-secondary education	-0.535	0.157	***	-0.124	0.059	**	-0.520	0.207	**	-0.161	0.078	**
Missing education	0.174	0.250		1.175	0.460	**	0.178	0.333		1.360	0.547	**
North	-0.013	0.072		-0.031	0.048		-0.077	0.140		-0.088	0.074	
South-Islands	0.302	0.074	***	0.385	0.051	***	0.683	0.151	***	0.777	0.094	***
Employed	-0.165	0.083	**	-0.463	0.043	***	-0.338	0.117	***	-0.652	0.059	***
Partner employed	-0.382	0.101	***	-0.494	0.048	***	-0.730	0.146	***	-0.707	0.067	***
Change disability status	-0.006	0.062		-0.038	0.087		0.006	0.083		0.011	0.109	
Married/coabitant	0.105	0.070		0.030	0.047		0.059	0.114		0.029	0.067	
Children 0-5	-0.151	0.171		0.226	0.047	***	-0.080	0.217		0.380	0.068	***
Household size	-0.086	0.035	**	-0.024	0.019		-0.235	0.060	***	-0.047	0.028	*
Constant	-0.961	0.162	***	-0.969	0.081	***	-0.571	0.253	**	-0.924	0.115	***
Sigma u	0.000	0.005		0.001	0.005							
Rho	0.000	0.000		0.000	0.000		0.663	0.055	***	0.469	0.056	***
Theta							1.156	0.183	***	1.516	0.240	***
Number of observations	3501			9062			4684			12124		
Number of households	1171			3031			1171			3031		
Log likelihood	-1255.78			-3052.69			-1862.69			-4432.80		

Source: our elaboration on IT-SILC data

Table A3. Strong definition of disability (4 years of limitations, and at least 2 of strong limitations)

	HHD			HHND			HHD			HHND		
	Coef.	s.e.		Coef.	s.e.		Coef.	s.e.		Coef.	s.e.	
Lag low income position	**2.150**	0.099	***	**1.903**	0.033	***	**1.202**	0.283	***	**1.097**	0.074	***
Age 16-29	-0.160	0.282		-0.028	0.063		-0.330	0.377		-0.042	0.084	
Age 45-60	-0.049	0.216		-0.177	0.048	***	-0.325	0.360		-0.234	0.066	***
Age over 60	-0.253	0.217		-0.343	0.056	***	-0.427	0.350		-0.354	0.076	***
Male	-0.129	0.102		-0.100	0.033	***	-0.171	0.142		-0.122	0.042	***
Max. low education	0.038	0.146		0.339	0.040	***	0.122	0.221		0.523	0.058	***
Min. Post-secondary education	-0.915	0.302	***	-0.139	0.056	**	-1.450	0.466	***	-0.165	0.074	**
Missing education	0.115	0.382		0.551	0.249	**	0.201	0.538		0.663	0.298	**
North	0.194	0.129		-0.060	0.042		0.441	0.278		-0.143	0.066	**
South-Islands	0.403	0.131	***	0.349	0.044	***	0.950	0.332	***	0.735	0.082	***
Employed	0.117	0.149		-0.438	0.040	***	0.003	0.206		-0.626	0.054	***
Partner employed	-0.200	0.182		-0.482	0.045	***	-0.332	0.305		-0.711	0.062	***
Change disability status	0.118	0.102		-0.061	0.057		0.153	0.133		-0.044	0.071	
Married/coabitant	0.252	0.117	**	0.019	0.041		0.384	0.201	*	-0.005	0.059	
Children 0-5	-0.197	0.251		0.218	0.046	***	0.080	0.608		0.380	0.066	***
Household size	-0.089	0.061		-0.034	0.017	**	-0.193	0.104	*	-0.074	0.026	***
Constant	-1.210	0.295	***	-0.946	0.074	***	-1.087	0.518	**	-0.828	0.106	***
Sigma u	0.001	0.009		0.001	0.005							
Rho	0.000	0.000		0.000	0.000		0.598	0.159	***	0.489	0.047	***
Theta							1.205	0.520	**	1.505	0.203	***
Number of observations	1199			11364			1604			15204		
Number of households	401			3801			401			3801		
Log likelihood	-429.31			-3875.41			-636.65			-5659.02		

Source: our elaboration on IT-SILC data

REFERENCES

Cappellari L. and Jenkins S. (2002) “Who stays poor? Who becomes poor? Evidence from the British household panel survey”, *Economic Journal*, vol. 112.

Cappellari L. and Jenkins S. (2002) “Modelling low income transitions”, IZA Discussion Paper No. 504.

Fremstad S., (2009) “Half in Ten: Why Taking Disability into Account is Essential to Reducing Income Poverty and Expanding Economic Inclusion” CEPR Reports and Issue Briefs, n. 30.

Jenkins, S.P. (2000) “Modeling household income dynamics”, *Journal of Population Economics*, vol.. 13, pp. 529-567.

Heckman, J.J. (1981), "The incidental parameters problem and the problem of initial conditions in estimating a discrete time-discrete data stochastic process," in C.F. Manski and D. McFadden (eds.), *Structural Analysis of Discrete Data with Econometric Applications*, 179-195. MIT Press: Cambridge, MA.

Meyer B.D. & Mok W.K.C., (2006), "Disability, Earnings, Income and Consumption," Working Papers 0610, Harris School of Public Policy Studies, University of Chicago

Mok W.C.K., Meyer B.D., Charles K.K. & Achen A.C., (2008), "A Note on "The Longitudinal Structure of Earnings Losses among Work-Limited Disabled Workers"," *Journal of Human Resources,* vol. 43(3), pages 721-728

Meyer B.D. & Mok W.K.C., (2006), "Disability, Earnings, Income and Consumption," Working Papers 0610, Harris School of Public Policy Studies, University of Chicago

Nolan, Whelan, Maitre and Layte (2000) “Poverty dynamics: an analysis of the 1994-95 waves of the European Community Household Panel”, ISER, EPAG, working paper n. 10.

Nolan, Whelan, Maitre and Layte (2001) “Persistent income Poverty and Deprivation in the European Union”, ISER, EPAG, working paper 17.

Parodi G., Sciulli D. (2008). Disability in Italian Households: Income, Poverty and Labour Market Participation. *Applied Economics*, vol. 40(20); p. 2615-2630

Poggi A. (2007) "Does persistence of social exclusion exist in Spain?", *Journal of Economic Inequality*, n.5, pp.53-72;

She P., Livermore G.A., (2007) "Material Hardship, Poverty, and Disability Among Working-Age Adults," *Social Science Quarterly*, Vol. 88, Number 4, pp. 970-981.

She P., Livermore G.A., (2009) "Long-Term Poverty and Disability Among Working-Age Adults," *Journal of Disability Policy Studies*; 19; 244.

Tibble M. (2005) "Review of Existing Research on the Extra Costs of Disability", Working Paper No. 21," United Kingdom Department for Work and Pensions.

Trivellato, Giraldo and Rettore (2002) "The persistence of poverty: true state dependence or unobserved heterogeneity? Some evidence from the Italian survey on household income and wealth", paper prepared for the 27th General Conference of the IARIW.

Whelan, Layte and Maitre (2001) "Persistent Deprivation in the European Union", EPAG working paper n.23, ISER.

WHO (2001), International Classification of Impairments, Disabilities, and Handicaps, ISBN 92 4 1545429, World Health Organization, Geneva.

Wooldridge (2005) "The initial condition problem in dynamic, non linear panel data models with unobserved heterogeneity", *Journal of Applied Econometrics*, n.20, pp. 39-54;

Zaidi A. and Burchardt T. (2003) "Comparing Incomes When Needs Differ: Equivalisation for the Extra Costs of Disability in the UK," CASE working paper 64.