

Once poor, always poor? Do initial conditions matter?

Evidence from the ECHP

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Abstract

The paper analyzes the effects of individual and household characteristics on current poverty status, while controlling for initial conditions, past poverty status and unobserved heterogeneity in 14 European Countries for the period 1994-2000, using the European Community Household Panel. The initial conditions problem arises because the start of the observation period in a panel data set does not coincide with the start of the stochastic process that generated the poverty experiences and, therefore, a positive result in terms of state dependence may be due to the fact that individuals with a higher tendency to remain permanently poor are over-represented in the sample. Four model specifications are tested controlling for initial conditions and unobserved heterogeneity at the same time. The distinction between true state dependence and individual heterogeneity has very important policy implications, since if the former is the main cause of poverty it is of paramount importance to break the “vicious circle” of poverty perhaps using income-supporting social policies, whereas if it is the latter anti-poverty policies should focus primarily on education, training, development of personal skills and other labour market oriented policies. The empirical results are similar in qualitative but rather different in quantitative terms across EU countries. State dependence remains significant in all specifications, even after controlling for unobserved heterogeneity or when removing possible endogeneity bias. Consequently, social benefits are likely to play an important role if breaking the “vicious circle” of poverty is among the main policy objectives of the policy-makers.

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1. INTRODUCTION

In the last decade, poverty dynamics research focuses on the issue of poverty state dependence. In other words, the main hypothesis to be examined is whether past poverty experiences determine current poverty status. This may happen, for instance, because poverty spells might result in depreciation of human capital and employment skills, causing low-pay or unemployment spells and finally increasing the duration of poverty spells or the frequency of poverty spells (poverty reoccurrence). If state dependence is 'genuine' then it is important in policy terms to break the "vicious circle" of poverty and try even at high cost to bring individuals out of poverty using social benefits policy. Nevertheless, the state dependence usually observed in dynamic panel data models may also be attributed to sorting effects in the sense that the individuals that escape poverty may possess certain observed (e.g. age, education level, employment status) or unobserved characteristics (willingness to escape poverty, cleverness, social networks, life attitudes) and, thus, differ in a systematic way from the individuals that remain poor. Consequently, when examining state dependence it is important to control for observed as well as unobserved heterogeneity. Furthermore, a positive result in terms of state dependence may also be due to the fact that individuals with a higher tendency to remain permanently poor may be over-represented in the sample (Cappellari and Jenkins 2004). Therefore, in the case of state dependence, controlling for the observed and unobserved determinants of initial poverty status (initial conditions) is also important.

In the current paper, we follow the methodology of Wooldridge (2005), which proposes a solution to handle the problem of endogeneity of the initial conditions, while controlling for unobserved heterogeneity at the same time. He suggests using a joint density distribution conditional on the strictly exogenous variables and the initial condition, instead of attempting to obtain the joint distribution of all outcomes of the endogenous variables. In this analysis, a multivariate random effects logit methodology has been applied for examining the issue of poverty state dependence in 14 EU Member-States for the period 1994-2000 using the data of the European Community Household Panel (ECHP).

In the next two sections, the issues of unobserved heterogeneity and initial conditions problem are discussed drawing evidence from previous studies in poverty, employment and low-pay dynamics. The European Community Household Panel is briefly presented in section 4 along with household income and poverty definitions. Section 5, analyzes the model to be applied and also refers to the econometric details of the analysis. The last two sections present the empirical results and the conclusions of our analysis, along with some policy implications.

2. TRUE STATE DEPENDENCE VERSUS UNOBSERVED HETEROGENEITY

True state dependence means that the experience of poverty in one year *per se* raises the risk of being poor also in the next year (Heckman 1981a). However, the state or duration dependence¹ observed in data may also be attributed at least partly to sorting effects rather than indicating true state dependence e.g. due to the depreciation of human capital (Poggi 2003). The sorting effects practically indicate that individuals with “favourable” characteristics such as better motivation to escape poverty, intelligence, social networks, and positive life attitude tend to leave poverty earlier. Therefore it is important along with the effect of time to control also for observed as well as unobserved heterogeneity.

In the last decade, researchers more consciously try to distinguish between true state dependence and individual heterogeneity. This distinction has very important policy implications. For instance, if true state dependence is indeed significant compared to the individual heterogeneity, then it is important to break

¹ State and duration dependence are often used in the literature are synonyms. However, state dependence determines how the probability to be poor in the current period depends on whether someone is poor in the previous period, while duration dependence indicates how the probability to be poor in the current period depends on the duration spent in the poverty spell. This means that when duration dependence is examined, more than one lagged values of the dependent variable are used in the regression, or when poverty exit or re-entries are examined (instead of poverty status *per se*) more than one period dummies are included in the hazard function. This paper focuses on state dependence as defined in this paragraph.

the “vicious circle” of poverty and try even at high cost to bring individuals out of poverty using social benefits policy. On the contrary, if individual heterogeneity defines the duration of poverty then anti-poverty policies should focus on other schemes such as education, development of personal skills and capacities or other labour market and social policies.

Most studies find that poverty state dependence remains significant even when controlling for unobserved heterogeneity. Canto (1996) examines the duration dependence for poverty entries and exits in Spain using a non-parametric specification for the hazard rate. She controls for unobserved heterogeneity indirectly by testing the homogeneity of the hazard rate between groups which are likely to have different spell lengths. She finds significant duration dependence both for poverty re-entries and exits. Cappellari and Jenkins (2004) using data from the BHPS for the 1990s conclude that there is substantial state dependence in poverty, separately from the persistence caused by heterogeneity. Poggi (2007) studies social exclusion dynamics in Spain and also finds that both individual heterogeneity and true state dependence are related to the probability of experiencing social exclusion. Biewen (2003) finds that even after controlling for observed and unobserved individual characteristics, there is negative state dependence in poverty exit and re-entry behaviour. He also calculates that 6% of the German population has unobserved characteristics that lead to low poverty exit and high re-entry rates, therefore making these individuals possible candidates for chronic poverty.

On the other hand, Giraldo *et al.* (2002) highlight that there are two sources of unobserved heterogeneity which interest the study of poverty related first to the ability of household members to obtain income in a specific period and second to the way which this ability evolves over time. This is the main difference with previous analysis that assume that unobserved characteristics are time-invariant. When allowing for time-variant unobserved heterogeneity, the authors do not find any sign of true state dependence in their analysis of persistent poverty in Italy. This finding reinforces the theory of incentives of the poor which may vary not only among individuals but also with time.

As underlined by Aassve *et al.* (2006), there is also another issue on whether it is poverty experience or low income experience that really affects individuals with regards to the duration dependence. Poverty spells are not like unemployment spells, during which the individual is completely aware of the situation and his choices and preferences might be affected from his position. Studies that focus on low pay instead of poverty (Stewart and Swaffield 1999; Cappellari 2004) find that the probability of being low paid depends strongly on low pay in the previous year. In the same line, Finnie and Gray (2002), when examining individual mobility across earning quintiles, conclude that the probability of having an upward or downward transition depends negatively on the elapsed time that an individual has spent in a given quintile and this negative duration dependence remains significant when controlling for unobserved heterogeneity. On the contrary, the observed negative duration dependence in the exit rate proves to be more often spurious in unemployment studies (Cockx and Dejemeppe 2005).

3. THE INITIAL CONDITIONS PROBLEM

The initial conditions problem, developed by Heckman (1981b), in terms of transitions analysis, can be summarised to the fact that those who are poor in the first year of the survey may be a non-random sample of the population. Specifically, a positive result in terms of state dependence may be due to the fact that individuals with a higher tendency to remain permanently poor may be over-represented in the sample (Cappellari and Jenkins 2004). Therefore, in the case of state dependence, controlling for the observed and unobserved determinants of initial poverty status is important.

Practically, the problem arises because the start of the observation period does not coincide with the start of the stochastic process that has generated the poverty or non-poverty experiences. Arulampalam *et al.* (2000) highlight that even if the model controls for unobserved heterogeneity, in order to disentangle the effect of state dependence from unobserved heterogeneity, the initial conditions need to be modelled instead of assumed as exogenously given, because the initial conditions may be correlated with the unobservables.

The issue of initial conditions has been tackled more extensively in the literature of unemployment dynamics. Arulampalam *et al.* (2000) examine unemployment dynamics for men using the BHPS and introduce the econometric issues concerning the dynamic panel data models: unobserved heterogeneity (based on Chamberlain 1984), state dependence (based on Heckman 1981a, 1981c) and the initial conditions problem (based on Heckman 1981b). Even when controlling for initial conditions and unobserved heterogeneity, they find that there is strong state dependence especially for older unemployed individuals that may be attributed to depreciation of human capital, signalling (in the sense that past unemployment spells signal the capacities or productivity of individuals for future employees) and to the fact that unemployed individuals may accept low quality jobs and this may lead to enterprise closure and future unemployment spells. Arulampalam (2002) extends the above work further in various directions, using different definitions for unemployment.

Cappellari and Jenkins (2004) use first-order Markov model in order to study poverty transitions². The great virtue of this model, which is a complement to hazard and covariance structure models, is that it allows to control for initial conditions effects. In addition, these models control for potential non-random sample retention (for individuals that do not attrite and for whom at least two consecutive household incomes are observed). Models that control for initial conditions are also used in studies of earnings mobility rather than poverty (Stewart and Swaffield 1999; Cappellari 2004).

The methodology that we use in this paper in order to control for initial conditions is based on Wooldridge (2005), which proposes a solution to handle the problem of endogeneity of the initial conditions, while controlling for unobserved heterogeneity at the same time. He suggests using a joint density distribution conditional on the strictly exogenous variables and the initial condition, instead of

² Also Schluter (1997) uses a Markov model with exogenous variables in order to study the German income mobility with some extensions to poverty dynamics and Van Kerm (1998) studies low income turnover in the region of Wallonia in Belgium using Markov chain models. For a discussion of advantages and disadvantages of these models see Jenkins and Van Kerm (2000).

attempting to obtain the joint distribution of all outcomes of the endogenous variables (Hsiao 1986). For the binary response models of probit and logit form, the main advantage of this method is that it can be applied easily using standard random effects software. Yet, the explanatory variables included in the model must be strictly exogenous and at most one lag³ of the dependent variable can be used in the estimation. Another restriction of the model is that it can be applied only to balanced panel data. This reduction from unbalanced to balanced panel data can always result in discarding useful information. For an application of this methodology to social exclusion see Poggi (2007) .

4. THE EUROPEAN COMMUNITY HOUSEHOLD PANEL AND DEFINITIONS

The empirical research of the current paper is based on the data of the European Community Household Panel (ECHP) produced by the Living Conditions Unit (E-2) of the Social and Regional Statistics and Geographical Information System Directorate (E) of EUROSTAT in Luxembourg. The European Community Household Panel (ECHP) can be defined as a harmonized cross-national longitudinal survey, which focuses on income and living conditions of households and individuals in the European Union. Due to its multidimensional nature ECHP provides information at micro-level across countries and across time on: income, employment, health, education, housing, migration, social transfers and social participation, as well as demographics. In other words, as Eurostat describes it, ECHP offers data on EU social dynamics (Eurostat 2003b). The duration of the survey is eight years, thus ECHP consists of eight waves, one for each year, from 1994 to 2001. The ECHP covers all the 15 Member-States of the EU in that period, but not all countries have participated in all waves. In addition some Member-States as the UK and Germany used data from existing panel surveys and converted

³ D' Addio and Honore (2002) claim that the probability of exiting poverty may depend not only on the poverty status of the last period, but on the poverty status in the two most recent periods and they model second order state dependence, while controlling time-varying explanatory variables.

them to ECHP format. In the current paper, we use all eight waves of the ECHP for 14 EU Member-States⁴

Most of the income components in the ECHP have an annual time frame of the calendar year preceding the interview. In all the ECHP countries, apart from the UK, the calendar year coincides with the tax year, which is the reference period for income components. Although, in this way income comparability is ensured, other variables like the household composition variables, the economic activity status etc. refer to the time of interview and might not relate well to income measured over a period up to twelve months in the past (Eurostat 2001). This is particularly undesirable for poverty dynamic analysis that tries to identify changes in income components and also uses the lag poverty status as an explanatory variable. Therefore for the needs of the dynamic analysis that follows, we have reconstructed the household income, transferring all the income components one year back⁵.

Following the practice of Eurostat, the poverty line used in the current thesis is set at 60% of the national median equivalised household income per capita, as it has been calculated using the modified OECD scale which assigns 1 to the first adult, 0.5 to the next adults and 0.3 to children.

5. THE MODEL AND ECONOMETRIC DETAILS OF THE ANALYSIS

The main difference of this model with a typical hazard model examining state dependence is that the dependent variable is the poverty status *per se* (whether someone is poor or non-poor) and not a variable signalling the poverty entry or exit. Moreover, state dependence is not captured with time dummies, but with the lagged value of the dependent variable. According to Wooldridge (2005, p. 42), only one lag of the dependent variable can be used when controlling for initial

⁴ For Sweden only cross-sectional data are available therefore Sweden has been excluded from the analysis.

⁵ It should be underlined that we do not simply lag one wave back the total net household income, but we take into account the different composition that each household might had in the previous have. The algorithm for the reconstruction of household income is available from the authors on request.

conditions. Nevertheless, this means that we cannot measure duration dependence, how much the chances of exiting poverty fall the longer one is in poverty⁶. Initial conditions are captured by introducing in the regression the value of the dependent variable in the first period. In this way, The assumption of exogeneity of all the explanatory variables is a strong assumption and therefore is tested at the end of the analysis.

More specifically for a random individual in the population and $t=1, 2, \dots, T$, the conditional probability that poverty occurs is:

$$P(y_{it} = 1 | y_{i,t-1}, \dots, y_{i0}, z_i, c_i) = \Phi(z_{it}\gamma + \rho y_{i,t-1} + c_i) \quad (1)$$

Where y_{it} is the dependent variable or the poverty state of the individual i at period t (when $y_{it} = 1$ the individual is poor in period t and when $y_{it} = 0$ the individual is non-poor), $\Phi(x)$ is the logistic function $\Phi(x) = \frac{\exp(x)}{1 + \exp(x)} = \Lambda(x)$, which is between zero and one for all real numbers x , γ and ρ are the parameters to be estimated, z_i and z_{it} are the vectors of time constant and time-varying explanatory variables and c_i is the unobserved effect. ρ is the coefficient of the lag value of the explanatory variable and the indicator of state dependence. If $\rho > 0$ being poor (non-poor) at $t - 1$ increases the chances of being poor (non-poor) at t .

There are three main assumptions related to equation (1). First, the dynamics are first order, once z_{it} and c_i are also conditioned on. Second, the unobserved effect is additive inside the standard normal cumulative distribution function $\Phi(x)$. Third, all time-constant and time-varying variables are strictly exogenous (Wooldridge 2005, p. 41).

By assuming that the unobserved effect follows a normal distribution given the initial poverty condition y_{i0} and the time-constant explanatory variables z_i :

$$c_i | y_{i0}, z_i \approx Normal(a_0 + a_1 y_{i0} + a_2 z_i, \sigma_\alpha^2) \quad (2)$$

⁶ This effect can only be captured when modelling poverty exit with hazard functions using time dummies so as to capture the increasing effect of state dependence year by year.

the parameters of equation (1) can be consistently estimated. a_1 offers information about the relationship between the unobserved effect and initial poverty status, while σ_α^2 indicates the dispersion accounted by unobserved heterogeneity. According to (Wooldridge 2005, p. 46), the density functions occurring from equations (1) and (2)

$$f(y_{it}, \dots, y_{iT} \mid y_{i0}, z_i, c_i; \gamma, \rho) = \prod_t \{ \Phi(z_{it}\gamma + \rho y_{it-1} + c_i)^{\gamma} \cdot [1 - \Phi(z_{it}\gamma + \rho y_{it-1} + c_i)]^{1-\gamma} \}$$

can be specified in such a way that standard random effects⁷ software can be used for the estimation.

The above estimation can be applied only to balanced panels. Therefore, there is a loss of information by dropping individuals that are not present in all seven waves⁸, while selection and attrition problems might also be present. Nevertheless, the loss of information is compensated by the fact that Wooldridge's methodology allows selection and attrition to depend on initial conditions. Specifically, individuals with different initial poverty status are allowed to have different missing data probabilities. In this way, attrition is controlled for without being explicitly modelled as a function of initial conditions (Poggi 2003; Wooldridge 2005; Poggi 2007). Moreover, since we control for initial conditions, we do not restrict the sample to an inflow sample and we also include in our analysis all the left-censored cases that we would have to exclude if a typical hazard analysis was used.

As in most poverty studies, since the equivalised household income per capita is used for the calculation of poverty status, it is indirectly assumed that the household members pool their income sources, therefore only personal characteristics of the household head are considered as regressors and not the personal characteristics of the household members (e.g. only the age of the

⁷ For the use of fixed effects when controlling for initial conditions in a different methodological framework see Hahn (1999). For a full discussion of the advantages of random effects versus fixed effects see Honore and Kyriazidou (2000) and Honore (2002).

⁸ Six for Austria and Luxembourg and five for Finland.

household head is taken into account and not the age of each household member). Consequently, members of the same household have the same poverty determinants and thus the same poverty status. Since the panel includes repeated observations from the same individual and from the same family, the problem of possible violation of the homoskedasticity assumption is present. Therefore, we use the “robust” or “sandwich” estimators for the standard errors, which allow observations to be dependent within cluster, although they must be independent between clusters (see Huber 1967; White 1980). The results reported in the following tables have been calculated without the use of weights and are reported in terms of odds ratios⁹.

6. EMPIRICAL RESULTS: ANALYSIS OF STATE DEPENDENCE CONTROLLING FOR INITIAL CONDITIONS

We have developed four specifications using the dynamic logit model presented in the previous section. [Table 1](#) describes all the variables used in the different model specifications. The first specification includes only the initial conditions dummy and the lagged value of the poverty status. In the second specification, variables controlling for the household and household head characteristics are included in the regression analysis. In the third specification, wave dummies have been included so as to control for business cycles effects. Finally, in the fourth specification certain variables that may have caused endogeneity bias are removed from the specification so as to test the sensitivity of the results. In order to facilitate comparisons across countries, the probability of the baseline group is reported on the top of each table.

In [Table 2](#), the results for the first specification are reported. Both the odds for the lagged poverty status and initial status are significant at the 0,1% level in all

⁹ An odds ratio compares the relative magnitude of two complementary probabilities: the probability that an event will occur versus the probability that it will not occur:

$$odds = \frac{probability}{1 - probability} \text{ (Singer and Willett 2003). The formula for calculating the odds when}$$

having the logit coefficients is: $odds = \exp^{\text{logit}}$.

14 Member-States. In most countries the initial conditions variable gives a much higher odds ratio than the lag poverty status with the exception of Denmark, Finland, the Netherlands, Portugal and the UK, where the difference is small or goes to the opposite direction, showing that poverty reoccurrence is also an important issue. Specifically, the odds ratio for the initial conditions variable ranges from 4.35 in Finland to 20.00 in Luxembourg, while the odds for the lagged poverty status ranges from 3.36 in Spain to 13.82 in Finland. As suggested by the standard deviation of the heterogeneity variance, σ_u , unobserved heterogeneity is large. Also, the likelihood ratio test for ρ ¹⁰ (not reported in this table) suggests that unobserved heterogeneity is statistically significant in all countries.

In specification 2 ([Tables 3A-B](#)), we include variables capturing certain characteristics of the household head and the household so as to control for the observed heterogeneity among individuals. The baseline group consists of individuals that were not poor in the initial and previous year and live in a household with a male household head, aged [30, 64], who has completed secondary education, is employed full-time and is a citizen of the country under examination. There are no dependent children in the household. None of the household members is unemployed, none of the household members has severe disability or chronic disease and finally the household does not pay rent for household accommodation (either one of the household members owns the household or accommodation is provided for free). The probability of being poor while belonging to the baseline group is around 1% to 2% in all countries. The fact that there are not large differences in the baseline probability across countries, means that the choice of the baseline group is successful in facilitating comparisons among countries. [Table 3B](#) presents the estimated probabilities for each particular regressor holding constant the other characteristics of the baseline group.

¹⁰ ρ is the ratio of the heterogeneity variance to one plus the heterogeneity variance $\rho = \frac{(\sigma_u)^2}{1 + (\sigma_u)^2}$ and in a way indicates how much of the model variance is due to unobserved heterogeneity.

As expected, the effect of past poverty experiences decreases in almost all countries in comparison to specification 1, when the household and the household head variables are added in the regression. The decrease in the odds ratios corresponding to the effect of initial conditions is greater than the decrease in the odds ratios of lagged poverty status. This is expected since the socioeconomic variables that are included in the regression may also in a way determine whether someone is poor at the first place¹¹.

Living in a household with a household head aged less than 30 or more than 64 increases the odds of being poor in all countries. The effect is very strong for young headed households in Finland (3.57) and Denmark (3.37) as compared to the baseline group, as well as households headed by elderly in Denmark. Netherlands, is the only country where the chances to be in poverty significantly decrease for individuals living with household heads aged more than 64, as compared to the baseline group. The vulnerability of female-headed households to poverty is not evident in all countries. Only in Finland (1.43), France (1.26) and Germany (1.20) the odds of being poor are significantly increased ($p < 0.001$) when living in a female-headed household. In Spain and Italy, the effect is significant only at the 5% level, while in Portugal, living in a female-headed household significantly decreases the probability of being poor (0.79).

The level of education of the household head also plays an important role in determining the chances of being in poverty at a particular point in time. Living in a household with a household head who has completed higher education sharply decreases the chances of being poor, while household heads with primary education increase the odds of being in poverty in all countries but the Netherlands that exhibits a particularly low odds ratio (0.23). As expected, unemployment and inactivity of the household head also increase the probability of poverty. The effect of unemployment is particularly strong in Belgium (6.29) and Ireland (5.62) and that

¹¹ I have also run the above regressions controlling only for state dependence and not initial conditions. The odds ratio for experiencing poverty in the previous year is much higher than in specification 2, probably because it 'absorbs' a part of what the initial conditions variable captures. The results are available from the author on request.

of inactivity in Denmark (4.44)¹². The effect of citizenship of the household head is mixed across EU Member-States with a tendency to increase the probability of being poor both for the EU and the non-EU citizenship whenever the effect is significant. The highest risk of being poor while living in a household with an immigrant household head is observed in Luxembourg (5.00); especially when the household head has a non-EU citizenship. Nevertheless, there are issues of possible under-representation of immigrants in the ECHP sample and, thus, the results concerning immigration variables should be tackled with care¹³.

In all countries, the presence of dependent children in the household increases the chances of being poor with the exception of Denmark, where the effect is not significant¹⁴. This can be explained by the fact that in this country families with children are important recipients of social transfers¹⁵. Having an unemployed (other than the household head) or a disabled household member in the household also increases the chances of being in poverty in the Member-States where the corresponding odds ratio is significant. Finally, paying rent for household accommodation, in general terms increases the chances to be poor, with the exception of Greece and Portugal. Nevertheless, the large differences in the extent of homeownership across Member-States do not allow us to make safe comparisons.

¹² This result is in accordance with the high poverty rate for elderly people in Denmark (32,3%).

¹³ In most countries, immigrants are undocumented and refuse to participate in surveys. Moreover, in the way that ECHP sample persons were selected, immigrants could only appear in the panel, if they were selected at the first wave or if they move in to a sample household in the next waves. Therefore, it can be alleged that ECHP does not measure properly the dynamics in the population occurring from immigration inflows.

¹⁴ When poverty transitions are examined, in Denmark and Finland the chances of exiting poverty increase, when dependent children are present into the household (the results are available from the author on request) (Andriopoulou 2008).

¹⁵ In Denmark, the household income of a couple with two dependent children consists of 15,63% of social benefits (which is the lowest among all household types with dependent children). The relevant EU mean is 10,44%, while the lowest figure is observed in Greece, where only 1% of household income of a couple with two dependent children comes from social benefits.

For instance, in Greece the percentage of poor individuals that live in accommodation owned by household is 89,11% (the highest within the EU), while in Germany only 28,27% (the lowest within the EU).

In total, specification 2 ([Table 3A](#)) fits much better than specification 1 ([Table 2](#)), since both the Akaike Information Criterion (Akaike 1973) and the Bayesian Information Criterion (Schwarz 1978) decrease¹⁶. Yet, as suggested by σ_α unobserved heterogeneity remains large and significant at the 0.1% level in all countries.

In specification 3 ([Table 4](#)), we add wave dummies in order to control for possible business cycle effects, especially for the time-varying variables such as the employment dummies. The wave dummies are less than unit in most cases that they are significant (with the exception of Portugal), indicating that in these waves as compared to the baseline wave (wave 1 - year 1994) the chances to be in poverty for the baseline group were lower *per se*. When the AIC statistic is used, the model fits better than the previous one. Yet, the BIC statistic increases in most countries as compared to specification 2, meaning that specification 2 fits better than specification 3. Therefore, it is not clear if specification 3 fits better than specification 2 in all countries. Unobserved heterogeneity remains significant at the 0.1% level in all countries. At the same time the effect of state dependence remains also very strong in all 14 EU Member-States¹⁷.

¹⁶ AIC and BIC can be used since the two model specifications have been used using the same dataset and the same estimation method (Singer and Willett 2003).

¹⁷ I have also run the above three specifications using a standard logit regression without controlling for unobserved heterogeneity. What is interesting to note is that although the odds ratio for the household and household head characteristics are slightly higher when unobserved heterogeneity is not controlled for, the odds for the state dependence are much more higher while the odds for the initial conditions much lower. This suggests that when unobserved heterogeneity is not controlled for, there is an underestimation of the magnitude of initial conditions with respect to the poverty status in the previous year and vice-versa. The corresponding results for specification 3 are presented in [Table 6](#). Results for all specification without controlling for unobserved heterogeneity are available from the authors on request.

According to Wooldridge (2005, p. 41), when applying the methodology described in section 5, for the estimators to be efficient, all time-constant and time-varying variables must be strictly exogenous. The strict exogeneity assumption means that since we control for the past poverty status and unobserved heterogeneity, current poverty status must be unrelated to the value of the regressors in past or future period. In other words, violation of the exogeneity assumption exists if there are feedback effects from poverty status to future values of the covariates included as regressors in the logit model. Individual characteristics such as age, gender and nationality cannot depend on past poverty status. For education this is likely to apply for the limited period of observation used here. Nevertheless, the existence of past poverty spells might theoretically affect the employment status, fertility decisions (existence of dependent children in the household), employment and health status of household members. When examining feedback effects, Biewen (2004) finds that there is evidence that experiencing poverty has a negative effect on future employment behaviour and on household cohesion. Moreover, whether a household owns the household and, thus, does not pay rent for household accommodation might also depend on poverty status. Non-poor households have higher chances to get a loan and buy a household than poor households.

In the relevant literature, there is not any commonly accepted test for testing the exogeneity assumption, therefore a common practise adopted by the researchers is to rerun the model excluding from the specification the variables that might violate the exogeneity assumption and compare the coefficients. In [Table 5](#), the variables that may cause endogeneity have been removed from the model. In total, six variables have been excluded from the model (variables V10, V11, V16, V18, V20, V22, see [Table 1](#)) that are related to the employment status of the household head, the existence of dependent children, unemployed or disabled household members in the household, and paying rent for household. Despite the fact that a large number of variables is removed from the specification, when comparing the results of [Table 4](#) and [Table 5](#), we do not find large differences in the estimates for the variables that are common in both specifications, thus, the variables that were removed did not bias the results. Thus, I indirectly conclude that the state

dependence effects observed in previous specifications are not biased by endogeneity problems. Given that the AIC and BIC have increased as compare to specification 3, meaning that the explanatory power of the model has deteriorated, there is no reason to remove the above variables from the model specification.

For each value of the predictor in period j there is a postulated value of the logit hazard. In [Table 7](#), the impact of past poverty experience (initial and in the previous year) on the conditional probability of being in poverty is estimated using specification 1 with and without controlling for unobserved heterogeneity. [Table 8](#), also, estimates the impact of state dependence on the conditional probability of being in poverty now averaged over the other covariates (specification 2). The estimation probabilities reveal that when we do not control for unobserved heterogeneity the effect of poverty in the previous year is much stronger than the initial poverty status. When unobserved heterogeneity is controlled the result is reversed.

The probabilities in both parts of [Table 7](#) correspond to four combinations of past poverty status. In the first line, the probability of individual to experience poverty is estimated, when he/she is non-poor both in the initial and the previous year. When unobserved heterogeneity is taken into account, the probability to be in poverty in period t , while being non-poor in the initial year and in $t-1$ declines to half in most Member-States. If the individual has experienced poverty in the past, either in the previous or initial year, the probability to be poor in t increases as compared to the initial combination (non-poor in the initial period, non-poor in $t-1$). When I do not control for unobserved heterogeneity experiencing poverty in the previous year is a much stronger determinant than experiencing poverty in the initial year only. The probabilities are higher than 0.40 in all Member-States for the second combination (non-poor in the initial year, poor in the previous year,), while for the third combination poor in the initial year, non-poor in the previous year), the probabilities range from 0.10 in the Netherlands to 0.24 in Greece. Yet, this result is reversed, in Part B of [Table 7](#), when unobserved heterogeneity is controlled for in almost all countries (except for Finland and the Netherlands). The probabilities for combination 2 range from 0.08 in Belgium to 0.36 in Finland, while for combination

3, the probabilities increase and range from 0.11 in the Netherlands to 0.42 in Greece. Finally, the individuals that have experienced poverty both in the initial and the previous year have the highest probabilities to be in poverty in t with or without controlling for unobserved heterogeneity. In the first case, the probabilities range from 0.66 in the Netherlands to 0.81 in Portugal and in the second case from 0.49 in the Netherlands to 0.79 in Portugal.

[Table 8](#) estimates the relevant probabilities using specification 2 and, thus, a more favourable (with regards to poverty status) baseline group¹⁸. In general, all estimated probabilities are lower than in the previous table. Specifically, Part A of [Table 8](#) (without unobserved heterogeneity) reveals that the probability of being poor in t while being non-poor in the initial year of the survey and in year $t-1$ ranges from 0.01 in Luxembourg to 0.04 in Austria, Greece, Ireland and the Netherlands for the baseline group. When the individual is non-poor in the initial year, but poor in the previous year (combination 2), the probability of being poor in t increases sharply and ranges from 0.13 in Denmark to 0.35 in Austria. The probabilities are much lower, when the individual appears to be poor in the initial year but non-poor in the previous year (from 0.03 to 0.13). Finally, when both the initial and lagged poverty values are 1, the probability of being poor ranges from 0.26 in Denmark to 0.66 in Austria. In line with specification 1, when observed heterogeneity is controlled for (Part B of [Table 8](#)), the probabilities as well as the differences among Member-States decline. The probability of being poor in t , while being non-poor in the initial year of the survey and in the year $t-1$ ranges from 0.01 to 0.02. This means

¹⁸ The baseline group consists of individuals that were not poor in the initial and previous year and live in a household with a male household head, aged [30,64], which has completed secondary education, is employed full-time and is a citizen of the country under examination. There are no dependent children in the household. None of the household members is unemployed, none of the household members has severe disability or chronic disease and finally the household does not paying rent for household accommodation (either one of the household members owns the household or accommodation is provided for free). As the previous analysis indicates, in most cases, the probability of being in poverty is much lower for individuals belonging to the baseline group, than in other population groups that posses different household or household head characteristics.

that individual unobserved characteristics “absorb” part of the differences in predicted probabilities across Member-States. The probability of being poor in t , while being non-poor in the initial year, but poor in the previous year is now much lower (ranging from 0.05 in Denmark to 0.11 in the UK) and lower than the corresponding probabilities for being poor in the initial year and non-poor in the previous year (ranging from 0.04 in Denmark to 0.22 in Austria and Ireland). Finally, the probabilities of being poor in t , while being non-poor both in the initial year and in the year $t-1$ are on average 0.09 points lower than the probabilities without controlling for unobserved heterogeneity. The lowest value is 0.15 in Denmark and the highest 0.57 in Austria.

The general conclusion to be drawn from these two tables is that, *ceteris paribus*, the probability of being in poverty now is higher for individuals that have experienced poverty in the past both with or without unobserved heterogeneity. When unobserved heterogeneity is added in the regression, probabilities decline and the effect of being poor only in the initial year (not the previous year) is higher than the effect of being poor only in the previous year (not the initial year).

7. CONCLUSIONS

The aim of this paper was to study the dynamics of poverty and in particular whether past poverty experience affects current poverty status. Our main conclusion is that state dependence remains significant in all specifications, even when controlling for observed, unobserved heterogeneity and initial conditions. Consequently, social benefits are likely to play an important role if breaking the “vicious circle” of poverty is among the main policy objectives of the policy-makers.

We also find that the coefficient of initial poverty status is significant in all specification and when we control for unobserved heterogeneity the magnitude of the coefficient is higher than the magnitude of the coefficient of lag poverty status. This indicates that an early intervention is necessary. As Finnie (2000) underlines, given the state dependence and the intergenerational effect that poverty often has, an early intervention offers the maximum of benefits to the poor households and

society, because there are greater chances for an early than a late intervention to have long-lasting effects.

Irrespectively of the magnitude of state dependence, unobserved heterogeneity remains also important in all specifications and its magnitude (as captured by σ_a) does not decrease as the specification of the model improves. Moreover, the results for the observed household and household head characteristics indicate that individual heterogeneity also affects current poverty status. Consequently, anti-poverty policies should include other schemes such as education, development of personal skills and capacities or other labour market and social policies. It is also important to note that having an income over or under the poverty line and, thus, being characterised as “poor” or “non-poor” is not directly observable from individuals (contrary to the unemployment situation for example) and may not affect the behaviour and choices of persons and families as strong as it would be necessary for escaping from poverty. Building good incentives for the poor people to work harder, take advantage of opportunities and exploit life-chances might also be necessary.

To conclude, the empirical results of this paper indicate that both state dependence and individual heterogeneity (observed or unobserved) play an important role in keeping individuals into poverty. Consequently, there is no single path into or out of poverty, suggesting that multiple policies can be considered to help people getting out of poverty. Given that the education and development of personal skills is a long-run process, which is also related to household income levels, the importance of the intervention of state in the short-run for breaking the “vicious cycle” should be emphasized.

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APPENDIX

Table 1: Description of variables used in the different specifications of the model

	Variable	Description	Notes
	poor_lag	The poverty status in the previous year. Takes the value of 1 if the individual was poor in the previous year and 0 if the individual was non-poor in the previous year.	
	poor_0	The poverty status in the first year that the individual enters the panel (not necessarily the first wave). Takes the value of 1 if the individual was poor in the initial year and 0 if the individual was non-poor in the initial year.	
	Household head variables		
V1	Aged <30	Takes the value of 1 if the household head is less than 30 years old. The household head can only be an adult, meaning over 16 years old	
V2	Aged [30,64]	Takes the value of 1 if the household head is 30 years old or older, but younger than 65	Dummy omitted – baseline group
V3	Aged >65	Takes the value of 1 if the household head is over 65	
V4	Male	Takes the value of 1 if the household head is male	Dummy omitted – baseline group
V5	Female	Takes the value of 1 if the household head is female	
V6	Higher education	Takes the value of 1 if the household head has completed recognised third level education (ISCED 5-7) (Eurostat 2003a, p. 356) ¹⁹	
V7	Secondary education	Takes the value of 1 if the household head has completed second stage of secondary level education (ISCED 3) (Eurostat 2003a, p. 356)	Dummy omitted – baseline group
V8	Primary education	Takes the value of 1 if the household head has completed less than second stage of secondary education (ISCED 0-2) (Eurostat 2003a, p. 356)	

¹⁹ In case of missing values in the educational variable, I impute the relevant information from the previous or next year or the closest year with a valid value. In case of measurement error in the educational variable (e.g. an individual that appears to have completed higher education in the first three waves, he then appears to have completed primary education), I compute the frequency of the two values in all waves and I change them all to the value of which the frequency prevails. Yet, if more than two different values are involved, no change is made.

V9	Employed	<i>Takes the value of 1 if the household head considers himself employed²⁰</i>	<i>Dummy omitted – baseline group</i>
V10	Unemployed	Takes the value of 1 if the household head considers himself unemployed	
V11	Inactive	Takes the value of 1 if the household head considers himself inactive	
V12	National	<i>Takes the value of 1 if the household head is national</i>	<i>Dummy omitted – baseline group</i>
V13	Other EU citizenship	Takes the value of 1 if the household head is not a national but he/she is an EU citizen	
V14	Other non-EU citizenship	Takes the value of 1 if the household head is a non-EU citizen	
	Household variables		
V15	Having no dependent children	<i>Takes the value of 1 if dependent children are present in the household</i>	<i>Dummy omitted – baseline group</i>
V16	Having at least one dependent child	Takes the value of 1 if the household does not have any dependent children	
V17	Not paying rent for household accommodation	<i>Takes the value of 1 in case of home ownership or accommodation provided free</i>	<i>Dummy omitted – baseline group</i>
V18	Paying rent for accommodation	Takes the value of 1 in case the household pays rent for accommodation	
V19	Having no unemployed hh member (excluding head)	<i>Takes the value of 1 if there is none unemployed household member in the household (excluding the household head)</i>	<i>Dummy omitted – baseline group</i>
V20	Having at least one unemployed hh member (excluding head)	Takes the value of 1 if there is at least one unemployed household member in the household (excluding the household head)	
V21	Having no hh member with severe disability or chronic disease	<i>Takes the value of 1 if there is none disabled household member in the household</i>	<i>Dummy omitted – baseline group</i>
V22	Having at least one hh member with severe disability or chronic disease	Takes the value of 1 if there is at least one disabled household member in the household	

²⁰ In 1994 and 1995, persons working less than 15 hours are automatically classified as unemployed or inactive; starting 1996, those considering that their main activity is 'working' are classified as employed. The self-defined activity status was preferred in comparison to the ILO activity status which was not available with the same classification for all Member-States.

Table 2: Logit analysis of state dependence - Specification 1: with only initial and lag value of the dependent variable (controlling for unobserved heterogeneity)

Depvar=poverty status	Country													
	A	B	D	DK	E	EL	F	FIN	I	IRL	L	NL	P	UK
Baseline probability	0.03	0.02	0.02	0.03	0.06	0.05	0.03	0.04	0.04	0.05	0.02	0.02	0.04	0.04
poor_lag	5.26***	4.61***	5.92***	5.90***	3.36***	3.94***	5.46***	13.82***	3.87***	6.03***	8.30***	7.52***	8.63***	6.79***
poor_0	14.53***	16.10***	10.47***	7.40***	9.85***	14.40***	15.88***	4.35***	14.87***	8.79***	20.00***	6.34***	11.01***	7.19***
_constant	0.03***	0.02***	0.02***	0.03***	0.06***	0.05***	0.03***	0.04***	0.04***	0.05***	0.02***	0.02***	0.04***	0.04***
<i>Number of obs</i>	26,850	27,888	63,186	20,700	63,300	50,862	60,036	22,268	71,874	28,626	21,535	39,318	58,776	53,076
<i>Wald chi2</i>	3,129***	2,533***	5,429***	1,547***	6,121***	5,907***	6,861***	2,748***	7,274***	3,175***	2,575***	3,013***	11,509***	6,200***
<i>Log likelihood</i>	-7,219	-6,668	-13,970	-4,871	-22,854	-18,637	-16,379	-5,064	-23,593	-9,316	-4,170	-7,860	-19,735	-15,934
<i>AIC</i>	14,446	13,344	27,948	9,749	45,716	37,282	32,766	10,137	47,195	18,639	8,347	15,729	39,478	31,875
<i>BIC</i>	14,479	13,377	27,984	9,781	45,752	37,317	32,802	10,169	47,232	18,672	8,379	15,763	39,514	31,911
<i>sigma_a</i>	1.19***	1.21***	1.19***	0.94***	1.21***	1.40***	1.21***	0.59***	1.47***	1.18***	1.16***	0.93***	1.17***	1.15***
<i>rho</i>	0.30***	0.31***	0.30***	0.21***	0.31***	0.37***	0.31***	0.09***	0.40***	0.30***	0.29***	0.21***	0.29***	0.29***

Notes:

1. Source: ECHP UDB 1994-2000 (Dec 2003 - 2nd issue)
2. Odds ratio are reported
3. *p<0.05, **<0.01, ***p<0.001
4. d.c. - variable dropped due to collinearity
5. s.n.o - variable dropped due to small number of observations, variable predicts failure or non-failure perfectly
6. For Austria and Luxembourg four year dummies have been used and for Finland three, since these countries joined the panel one and two years later respectively
7. Baseline probability: non-poor initially and non-poor in the previous year

Table 3A: Logit analysis of state dependence - Specification 2: with initial and lag value of the dependent variable and other explanatory variables (controlling for unobserved heterogeneity)

Depvar=poverty status	Country													
	A	B	D	DK	E	EL	F	FIN	I	IRL	L	NL	P	UK
Baseline probability	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.02
poor_lag	4.79***	3.82***	4.79***	3.28***	3.16***	4.10***	4.78***	6.37***	3.73***	5.14***	6.53***	5.83***	8.38***	6.09***
poor_0	13.72***	8.01***	7.20***	5.30***	6.62***	7.76***	9.04***	7.64***	8.11***	5.64***	8.67***	4.93***	8.90***	4.15***
Household head														
Aged <30	1.69***	0.95	2.06***	3.37***	1.39***	1.78***	1.86***	3.57***	1.36**	1.27	1.02	2.17***	1.19	2.14***
Aged >64	1.46***	1.57***	0.91	2.29***	1.04	1.63***	0.73***	0.90	1.16**	1.47***	0.88	0.70***	1.73***	1.26***
Female	0.96	0.98	1.20***	1.05	1.14*	0.91	1.26***	1.43***	1.15*	0.96	1.08	1.04	0.79***	1.01
Higher education	0.63**	0.43***	0.52***	0.53***	0.34***	0.38**	0.51***	0.50***	0.56***	0.26***	0.28***	0.31***	0.25***	0.55***
Primary education	1.84***	1.83***	1.52***	1.39***	2.35***	3.02***	1.85***	1.54***	2.43***	1.38***	1.93***	0.23***	3.62***	0.95
Unemployed	2.30***	6.29***	4.59***	2.14***	2.82***	2.72***	3.68***	3.00***	2.98***	5.62***	3.36***	3.95***	2.60***	3.79***
Inactive	1.74***	2.30***	2.45***	4.44***	1.49***	1.31***	3.28***	3.50***	1.26***	3.37***	1.77***	3.09***	1.57***	3.18***
Other EU citizenship	0.23	1.60**	0.91	1.43	2.20	s.n.o.	1.40**	3.17**	s.n.o.	2.70***	1.79***	0.08*	0.36	0.84
Other non-EU citizenship	0.82	0.36**	1.32***	0.71	0.92	1.35	2.49***	4.25*	3.29*	0.86	5.00***	1.01	s.n.o.	1.20
Household														
Having at least one dep. child	1.39***	1.32**	1.48***	1.01	1.97***	1.55***	2.01***	1.23*	2.32***	1.23**	2.49***	2.83***	1.43***	1.85***
Paying rent for accommodation	0.87	1.96***	1.59***	1.64***	1.26***	0.83**	1.67***	1.66***	1.41***	1.90***	1.61***	2.33***	0.72***	2.06***
At least one unemp. (exc.head)	1.47**	1.11	1.77***	1.29	1.30***	1.08	1.48***	1.40**	2.12***	1.18*	1.70***	1.34***	1.42***	1.57***
At least one disabled member	1.57***	1.03	1.13*	1.06	1.19***	1.39***	1.26***	0.90	1.08	2.10***	d.c.	1.13	1.07	1.19***
_constant	0.02***	0.01***	0.01***	0.01***	0.02***	0.02***	0.01***	0.01***	0.01***	0.02***	0.01***	0.02***	0.01***	0.02***
<i>Number of obs</i>	26,850	27,888	63,186	20,700	63,300	50,862	60,036	22,268	71,874	28,626	21,535	39,318	58,776	53,076
<i>Wald chi2</i>	2,906***	2,754***	5,608***	1,802***	6,575***	6,702***	6,871***	2,520***	8,743***	3,800***	2,399***	3,200***	10,651***	6,788***
<i>Log likelihood</i>	-7,020	-6,206	-13,133	-4,311	-21,978	-18,014	-15,501	-4,550	-22,799	-8,593	-3,898	-7,332	-19,258	-14,962
<i>AIC</i>	14,074	12,446	26,301	8,656	43,990	36,061	31,036	9,134	45,632	17,219	7,828	14,698	38,551	29,958
<i>BIC</i>	14,213	12,586	26,455	8,791	44,144	36,202	31,189	9,270	45,788	17,360	7,956	14,844	38,704	30,109
<i>sigma_a</i>	1.37***	1.28***	1.35***	1.19***	1.26***	1.30***	1.34***	0.99***	1.31***	1.16***	1.31***	1.06***	1.27***	1.20***
<i>rho</i>	0.36***	0.33***	0.36***	0.30***	0.33***	0.34***	0.35***	0.23***	0.34***	0.29***	0.34***	0.25***	0.33***	0.31***

Notes: 1-6 see [Table 2](#)

7. Baseline probability: non-poor initially and non-poor in the previous year;

hh head: male, aged [30,64], having completed secondary education, being employed full-time and being a citizen of the country under examination;

hh: without dependent children, do not pay rent for household accommodation, none of the household members is unemployed, none of the household members has severe disability or chronic disease

Table 3B: Estimated probabilities for Specification 2

Depvar=poverty exit	Country													
	A	B	D	DK	E	EL	F	FIN	I	IRL	L	NL	P	UK
Baseline probability	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.02
poor_lag	0.09	0.04	0.05	0.03	0.06	0.08	0.05	0.06	0.04	0.09	0.06	0.10	0.08	0.11
poor_0	0.22	0.07	0.07	0.05	0.12	0.13	0.08	0.07	0.08	0.10	0.08	0.09	0.08	0.08
Household head														
Aged <30	0.03	0.01	0.02	0.03	0.03	0.03	0.02	0.03	0.01	0.02	0.01	0.04	0.01	0.04
Aged >64	0.03	0.02	0.01	0.02	0.02	0.03	0.01	0.01	0.01	0.03	0.01	0.01	0.02	0.02
Female	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.02
Higher education	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.01
Primary education	0.04	0.02	0.01	0.01	0.04	0.06	0.02	0.02	0.02	0.03	0.02	0.00	0.03	0.02
Unemployed	0.04	0.06	0.04	0.02	0.05	0.05	0.04	0.03	0.03	0.10	0.03	0.07	0.03	0.07
Inactive	0.03	0.02	0.02	0.04	0.03	0.03	0.03	0.03	0.01	0.06	0.02	0.06	0.02	0.06
Other EU citizenship	0.00	0.02	0.01	0.01	0.04	s.n.o.	0.01	0.03	s.n.o.	0.05	0.02	0.00	0.00	0.02
Other non-EU citizenship	0.02	0.00	0.01	0.01	0.02	0.03	0.02	0.04	0.03	0.02	0.05	0.02	s.n.o.	0.02
Household														
Having at least one dep. child	0.03	0.01	0.01	0.01	0.04	0.03	0.02	0.01	0.02	0.02	0.02	0.05	0.01	0.04
Paying rent for accommodation	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.04	0.02	0.04	0.01	0.04
At least one unemp. (exc.head)	0.03	0.01	0.02	0.01	0.03	0.02	0.01	0.01	0.02	0.02	0.02	0.03	0.01	0.03
At least one disabled member	0.03	0.01	0.01	0.01	0.02	0.03	0.01	0.01	0.01	0.04	d.c.	0.02	0.01	0.02

Notes: see [Table 2](#)

Table 4: Logit analysis of state dependence - Specification 3: with initial and lag value of the dependent variable, other explanatory variables and wave dummies (controlling for unobserved heterogeneity)

Depvar=poverty status	Country													
	A	B	D	DK	E	EL	F	FIN	I	IRL	L	NL	P	UK
Baseline probability	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.03	0.01	0.02
poor_lag	4.84***	3.83***	4.81***	3.17***	3.16***	4.12***	4.74***	6.07***	3.73***	4.96***	6.60***	5.92***	8.37***	6.12***
poor_0	13.71***	8.10***	7.22***	5.64***	6.60***	7.77***	9.18***	8.08***	8.11***	5.83***	8.59***	4.92***	8.96***	4.15***
Household head														
Aged <30	1.69***	0.96	2.08***	3.44***	1.40***	1.80***	1.89***	3.64***	1.36**	1.33	1.04	2.21***	1.19	2.17***
Aged >64	1.47***	1.55***	0.90	2.22***	1.02	1.63***	0.71***	0.89	1.15*	1.46***	0.88	0.70***	1.75***	1.24**
Female	0.96	0.97	1.19***	1.03	1.12	0.91	1.23***	1.42***	1.14*	0.94	1.06	1.03	0.80***	1.00
Higher education	0.63**	0.44***	0.52***	0.53***	0.34***	0.38**	0.51***	0.50***	0.56***	0.26***	0.28***	0.30***	0.24***	0.55***
Primary education	1.83***	1.89***	1.57***	1.45***	2.41***	3.06***	1.87***	1.60***	2.47***	1.41***	1.96***	0.22***	3.53***	0.95
Unemployed	2.31***	6.40***	4.66***	2.22***	2.91***	2.75***	3.70***	3.04***	2.99***	6.31***	3.53***	4.02***	2.59***	3.86***
Inactive	1.74***	2.27***	2.44***	4.41***	1.51***	1.30***	3.31***	3.53***	1.25***	3.47***	1.77***	3.12***	1.56***	3.22***
Other EU citizenship	0.24	1.53**	0.89	1.41	2.26*	d.c.	1.40**	3.17**	s.n.o.	2.71***	1.77***	0.08*	0.36	0.86
Other non-EU citizenship	0.83	0.36**	1.31**	0.75	0.97	1.34	2.49***	4.56**	3.39*	0.86	4.93***	1.06	s.n.o.	1.24
Household														
Having at least one dep. child	1.40***	1.33***	1.51***	1.02	2.03***	1.56***	2.04***	1.26**	2.36***	1.29***	2.54***	2.88***	1.42***	1.86***
Paying rent for accommodation	0.86	1.96***	1.59***	1.63***	1.30***	0.82**	1.67***	1.65***	1.42***	1.91***	1.63***	2.34***	0.72***	2.06***
At least one unemp. (exc.head)	1.50***	1.12	1.80***	1.35	1.33***	1.09	1.50***	1.47***	2.14***	1.20*	1.73***	1.34***	1.41***	1.58***
At least one disabled member	1.58***	1.04	1.13*	1.05	1.19***	1.38***	1.25***	0.90	1.08	2.14***	d.c.	1.13	1.08	1.20***
Wave dummies														
w2		0.73***	0.75***	0.58***	0.68***	0.91	0.85**		0.80***	0.81**		0.89	1.11*	0.88*
w3	0.90	0.65***	0.65***	0.65***	0.77***	1.01	0.76***		0.76***	0.60***	0.74**	0.79**	1.34***	0.90
w4	1.03	0.71***	0.65***	0.85	0.63***	0.76***	0.82***	0.64***	0.77***	0.66***	0.80*	0.72***	1.19***	1.10
w5	0.76***	0.63***	0.67***	0.91	0.76***	0.95	0.88*	0.88	0.78***	0.94	0.69***	1.04	1.02	0.95
w6	0.90	0.74***	0.68***	0.95	0.76***	0.96	1.02	0.95	0.81***	1.06	0.81*	0.83*	1.11*	1.06
_constant	0.02***	0.02***	0.01***	0.01***	0.02***	0.02***	0.01***	0.02***	0.01***	0.02***	0.01***	0.03***	0.01***	0.02***
<i>Number of obs</i>	26,850	27,888	63,186	20,700	63,300	50,862	60,036	22,268	71,874	28,626	21,535	39,318	58,776	53,076
<i>Wald chi2</i>	2,915***	2,765***	5,633***	1,814***	6,623***	6,716***	6,875***	2,524***	8,760***	3,772***	2,404***	3,213***	10,635***	6,805***
<i>Log likelihood</i>	-7,010	-6,189	-13,096	-4,291	-21,920	-17,994	-15,480	-4,535	-22,773	-8,547	-3,891	-7,318	-19,235	-14,949
<i>AIC</i>	14,062	12,422	26,236	8,626	43,884	36,029	31,003	9,110	45,590	17,138	7,822	14,680	38,514	29,942
<i>BIC</i>	14,234	12,603	26,435	8,801	44,083	36,215	31,202	9,270	45,792	17,319	7,982	14,868	38,712	30,138
<i>sigma_a</i>	1.37***	1.28***	1.35***	1.19***	1.26***	1.30***	1.34***	0.99***	1.31***	1.18***	1.30***	1.06***	1.27***	1.20***
<i>rho</i>	0.36***	0.33***	0.36***	0.30***	0.33***	0.34***	0.35***	0.23***	0.34***	0.30***	0.34***	0.36***	0.33***	0.30***

Notes: see [Table 2](#)

Table 5: Logit analysis of state dependence - Specification 4: with initial and lag value of the dependent variable, other explanatory variables and wave dummies (controlling for unobserved heterogeneity, excluding variables that may cause endogeneity)

Depvar=poverty status	Country													
	A	B	D	DK	E	EL	F	FIN	I	IRL	L	NL	P	UK
Baseline probability	0.02	0.03	0.02	0.02	0.04	0.03	0.03	0.03	0.03	0.04	0.01	0.07	0.01	0.03
poor_lag	4.97***	4.25***	5.40***	3.32***	3.25***	4.21***	4.95***	6.52**	4.16***	5.80***	7.07***	7.29***	8.46**	6.44***
poor_0	13.87***	10.95***	9.02***	6.33***	7.71***	7.83***	11.12***	7.95***	9.74***	7.24***	11.23***	5.89***	9.10***	6.06***
Household head														
Aged <30	1.43**	1.10	1.91***	4.90***	1.24*	1.62***	1.94***	5.51***	1.09	1.54**	0.99	1.82***	1.13	2.47***
Aged >64	1.73***	1.67***	1.01	5.86***	0.86***	1.55***	0.9	1.64***	0.79***	2.03***	0.77*	0.81*	1.80***	1.67***
Female	1.03	1.53***	1.44***	1.31***	1.05	0.9	1.49***	1.65***	1.00	1.36***	1.05	1.69**	0.88*	1.44***
Higher education	0.58***	0.41***	0.45***	0.46***	0.34***	0.35***	0.47***	0.43***	0.53***	0.22***	0.28***	0.24***	0.23***	0.54***
Primary education	2.01***	2.04***	1.68***	1.71***	2.58***	2.93***	2.09***	1.73***	2.55***	1.80***	2.09***	0.24**	3.53***	1.17**
Other EU citizenship	0.23	1.79***	0.99	1.16	3.00**	d.c.	1.45**	3.28**	s.n.o.	2.69***	2.09***	0.09*	0.3	0.81
Other non-EU citizenship	0.85	0.59	1.76***	0.74	1.11	1.3	3.94***	5.80**	3.27*	1.69	6.50***	1.94	s.n.o.	1.46
Wave dummies														
w2		0.73***	0.76***	0.56***	0.78***	0.91	0.86**		0.90*	1.04		1.12	1.13*	1.01
w3	0.92	0.68***	0.68***	0.63***	0.87**	1.01	0.78***		0.83***	0.77***	0.86	0.95	1.36***	0.97
w4	1.06	0.74***	0.69***	0.83	0.70***	0.76***	0.87*	0.67***	0.82***	0.78**	0.94	0.83*	1.22***	1.14*
w5	0.78**	0.65***	0.73***	0.9	0.81***	0.94	0.91	0.87	0.82***	1.03	0.74**	1.14	1.03	0.98
w6	0.9	0.74***	0.68***	0.92	0.70***	0.95	1.03	0.96	0.84***	1.1	0.84	0.87	1.11*	1.04
_constant	0.02***	0.03***	0.02***	0.02***	0.04***	0.03***	0.03***	0.03***	0.03***	0.04***	0.01***	0.08***	0.01***	0.03***
<i>Number of obs</i>	26,850	27,888	63,186	20,700	63,300	50,862	60,036	22,268	71,874	28,626	21,535	39,318	58,776	53,076
<i>Wald chi2</i>	2,869***	2,497***	5,127***	1,645***	6,067***	6,613***	6,506***	2,404***	7,995***	3,249***	2,351***	2,809***	10,603***	8,846***
<i>Log likelihood</i>	-7,069	-6,388	-13,556	-4,441	-22,301	-18,125	-15,895	-4,688	-23,309	-9,011	-3,972	-7,693	-19,386	-15,573
<i>AIC</i>	14,169	12,808	27,144	8,913	44,634	36,280	31,822	9,403	46,649	18,054	7,973	15,418	38,804	31,178
<i>BIC</i>	14,292	12,939	27,289	9,040	44,779	36,413	31,966	9,515	46,796	18,186	8,093	15,555	38,947	31,320
<i>sigma_a</i>	1.37***	1.36***	1.38***	1.24***	1.30***	1.30***	1.36***	1.00***	1.37***	1.24***	1.34***	1.09***	1.27***	1.28***
<i>rho</i>	0.36***	0.36***	0.37***	0.32***	0.34***	0.34***	0.36***	0.23***	0.36***	0.32***	0.35***	0.26***	0.33***	0.33***

Notes: 1-6 See [Table 2](#)

7. Baseline probability: non-poor initially and non-poor in the previous year;

hh head: male, aged [30,64], having completed secondary education, being a citizen of the country under examination;

Table 6: Logit analysis of state dependence - Specification 3: with initial and lag value of the dependent variable, other explanatory variables and wave dummies (without controlling for unobserved heterogeneity)

Depvar=poverty exit	Country													
	A	B	D	DK	E	EL	F	FIN	I	IRL	L	NL	P	UK
Baseline probability	0.04	0.03	0.03	0.03	0.04	0.04	0.03	0.02	0.03	0.04	0.02	0.04	0.02	0.03
poor_lag	13.57***	10.01***	13.06***	7.09***	7.54***	9.97***	12.63***	11.45***	9.39***	10.60***	16.83***	13.12***	18.34***	13.03***
poor_0	3.63***	2.95***	2.63***	2.60***	2.58***	2.67***	2.91***	3.62***	2.77***	2.46***	2.65***	2.38***	2.83***	1.92***
Household head														
Aged <30	1.44**	0.98	1.59***	2.75***	1.31***	1.56***	1.57***	2.83***	1.23*	1.33*	0.92	1.94***	1.22*	1.73***
Aged >64	1.41***	1.48***	1.01	1.72***	1.09	1.42***	0.84**	0.90	1.24***	1.29***	0.92	0.75**	1.57***	1.21**
Female	0.98	0.94	1.11*	1.02	1.06	0.96	1.11*	1.33***	1.14**	0.97	1.07	0.95	0.87***	0.97
Higher education	0.68**	0.52***	0.59***	0.60***	0.42***	0.44***	0.59***	0.52***	0.59***	0.31***	0.39***	0.34***	0.29***	0.64***
Primary education	1.47***	1.63***	1.39***	1.31***	1.95***	2.36***	1.56***	1.45***	1.92***	1.33***	1.79***	0.28***	2.92***	1.00
Unemployed	1.89***	4.88***	3.63***	2.24***	2.69***	2.18***	3.27***	2.69***	2.79***	4.27***	3.34***	3.49***	2.01***	3.66***
Inactive	1.38***	2.01***	1.96***	3.77***	1.40***	1.17***	2.38***	3.11***	1.13**	2.58***	1.63***	2.68***	1.38***	2.60***
Other EU citizenship	0.26	1.37*	0.92	1.40	1.29	d.c.	1.15	2.66**	s.n.o.	2.24***	1.45***	0.06***	0.46	0.80
Other non-EU citizenship	0.86	0.40**	1.16*	0.68	1.67	1.83*	1.78***	3.41*	2.73***	0.97	3.01***	0.89	s.n.o.	0.97
Household														
Having at least one dep. child	1.23***	1.32***	1.41***	1.01	1.69***	1.34***	1.75***	1.24**	2.05***	1.15*	2.28***	2.54***	1.33***	1.70***
Paying rent for accommodation	0.88*	1.67***	1.40***	1.26**	1.19***	0.87*	1.40***	1.49***	1.28***	1.57***	1.50***	1.93***	0.76***	1.60***
At least one unemp. (exc.head)	1.37**	1.04	1.60***	1.23	1.20***	1.02	1.31***	1.39**	1.88***	1.05	1.66**	1.27**	1.22***	1.48***
At least one disabled member	1.52***	0.99	1.11*	1.00	1.17***	1.33***	1.17***	0.88	1.07	2.07***	d.c.	1.15*	1.09**	1.18***
Wave dummies														
w2		0.67***	0.61***	0.56***	0.67***	0.89*	0.80***		0.72***	0.92		0.80**	0.90*	0.79***
w3	0.79**	0.67***	0.64***	0.69***	0.79***	1.01	0.78***		0.75***	0.67***	0.67***	0.76***	1.20***	0.88*
w4	1.01	0.75***	0.68***	0.88	0.66***	0.79***	0.87**	0.65***	0.79***	0.73***	0.78**	0.72***	1.08	1.07
w5	0.77***	0.68***	0.71***	0.91	0.81***	0.98	0.91*	0.90	0.81***	1.00	0.70***	1.03	0.97	0.93
w6	0.93	0.79**	0.72***	0.95	0.79***	0.97	1.03	0.97	0.84***	1.06	0.84	0.84*	1.09	1.05
<i>Number of obs</i>	26,850	27,888	63,186	20,700	63,300	50,862	60,036	22,268	71,848	28,626	21,535	39,318	58,733	53,076
<i>Wald chi2</i>	4,349***	3,941***	8,216***	2,576***	10,291***	9,937***	9,880***	2,873***	13,085***	4,748***	3,125***	4,810***	14,504***	9,531***
<i>Pseudo R2</i>	0.34	0.37	0.34	0.32	0.28	0.34	0.37	0.34	0.34	0.35	0.43	0.31	0.43	0.35
<i>Log pseudolikelihood</i>	-7,219	-6,373	-13,581	-4,378	-22,538	-18,536	-15,999	-4,594	-23,502	-8,712	-4,002	-7,506	-19,652	-15,267
<i>AIC</i>	14,479	12,789	27,204	8,799	45,117	37,112	32,040	9,226	47,043	17,466	8,042	15,054	39,345	30,575
<i>BIC</i>	14,643	12,962	27,395	8,965	45,307	37,289	32,229	9,378	47,227	17,639	8,193	15,234	39,524	30,762

Notes: see [Table 2](#)

Table 7: Prediction probabilities for being poor at t given initial and lag poverty values from Specification 1

A. Without controlling for unobserved heterogeneity		Probability of being poor at t													
Initial poverty status	Poverty status at t-1	A	B	D	DK	E	EL	F	FIN	I	IRL	L	NL	P	UK
<i>Non-poor</i>	<i>Non-poor</i>	0.06	0.05	0.04	0.05	0.08	0.09	0.06	0.05	0.07	0.07	0.04	0.04	0.07	0.06
<i>Non-poor</i>	<i>Poor</i>	0.48	0.43	0.41	0.41	0.45	0.55	0.49	0.48	0.49	0.55	0.50	0.42	0.58	0.50
<i>Poor</i>	<i>Non-Poor</i>	0.18	0.16	0.11	0.13	0.21	0.24	0.18	0.13	0.21	0.17	0.14	0.10	0.18	0.13
<i>Poor</i>	<i>Poor</i>	0.76	0.75	0.68	0.68	0.71	0.79	0.78	0.73	0.76	0.76	0.80	0.66	0.81	0.71

B. Controlling for unobserved heterogeneity		Probability of being poor at t													
Initial poverty status	Poverty status at t-1	A	B	D	DK	E	EL	F	FIN	I	IRL	L	NL	P	UK
<i>Non-poor</i>	<i>Non-poor</i>	0.03	0.02	0.02	0.03	0.06	0.05	0.03	0.04	0.04	0.05	0.02	0.02	0.04	0.04
<i>Non-poor</i>	<i>Poor</i>	0.14	0.08	0.11	0.15	0.17	0.16	0.14	0.36	0.13	0.23	0.14	0.13	0.26	0.21
<i>Poor</i>	<i>Non-Poor</i>	0.30	0.24	0.17	0.18	0.37	0.42	0.32	0.15	0.37	0.31	0.29	0.11	0.31	0.22
<i>Poor</i>	<i>Poor</i>	0.70	0.60	0.55	0.57	0.67	0.74	0.72	0.71	0.70	0.73	0.77	0.49	0.79	0.66

Source: ECHP UDB 1994-2000 (Dec 2003 - 2nd issue)

Table 8: Prediction probabilities for being poor at t given initial and lag poverty values from Specification 2

A. Without controlling for unobserved heterogeneity		Probability of being poor at t													
Initial poverty status	Poverty status at t-1	A	B	D	DK	E	EL	F	FIN	I	IRL	L	NL	P	UK
<i>Non-poor</i>	<i>Non-poor</i>	0.04	0.03	0.02	0.02	0.03	0.04	0.02	0.02	0.03	0.04	0.01	0.04	0.02	0.03
<i>Non-poor</i>	<i>Poor</i>	0.35	0.23	0.20	0.13	0.18	0.28	0.20	0.19	0.22	0.30	0.14	0.34	0.27	0.28
<i>Poor</i>	<i>Non-Poor</i>	0.13	0.08	0.05	0.05	0.07	0.10	0.05	0.06	0.08	0.09	0.03	0.09	0.05	0.05
<i>Poor</i>	<i>Poor</i>	0.66	0.46	0.40	0.26	0.37	0.51	0.42	0.45	0.44	0.51	0.31	0.55	0.51	0.43

B. Controlling for unobserved heterogeneity		Probability of being poor at t													
Initial poverty status	Poverty status at t-1	A	B	D	DK	E	EL	F	FIN	I	IRL	L	NL	P	UK
<i>Non-poor</i>	<i>Non-poor</i>	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.02
<i>Non-poor</i>	<i>Poor</i>	0.09	0.04	0.05	0.03	0.06	0.08	0.05	0.06	0.04	0.09	0.06	0.10	0.08	0.11
<i>Poor</i>	<i>Non-Poor</i>	0.22	0.07	0.07	0.05	0.12	0.13	0.08	0.07	0.08	0.10	0.08	0.09	0.08	0.08
<i>Poor</i>	<i>Poor</i>	0.57	0.23	0.26	0.15	0.29	0.39	0.30	0.33	0.23	0.37	0.36	0.37	0.43	0.34

Notes:

1. Source: ECHP UDB 1994-2000 (Dec 2003 - 2nd issue)

2. Other variables have been set to the baseline group:

hh head: male, aged [30,64], having completed secondary education, being employed full-time and being a citizen of the country under examination;

hh: without dependent children, do not pay rent for household accommodation, none of the household members is unemployed, none of the household members has severe disability or chronic disease