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Comparing Poverty and Deprivation Dynamics: Issues of Reliability and Validity

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ABSTRACT

In this paper we seek to establish if earlier findings relating to the relationship between income poverty persistence and deprivation persistence could be due to a failure to take measurement error into account. In order to address this question, we apply a model of dynamics incorporating structural and error components. Our analysis shows a general similarity between latent poverty and deprivation dynamics. In both cases all unsystematic error is captured as change and we substantially overestimate mobility. Distinguishing between different types of reliability we find that by far the largest component of error is associated with overestimation of the probability of exiting from poverty or deprivation. We observe a striking similarity across dimensions at both observed and latent levels. In both cases levels of poverty and deprivation persistence are higher at the latent level. However, there is no evidence that earlier results relating to the differences in the determinants of poverty and deprivation persistence are a consequence of differential patterns of reliability. Taking measurement error into account seems more likely to accentuate rather than diminish the contrasts highlighted by earlier research. Since longitudinal differences relating to poverty and deprivation cannot be accounted for by measurement error, it seems that we must accept that we are confronted with issues relating to validity rather than reliability. Even where we measure these dimensions over reasonable periods of time and allow for measurement error, they continue to tap relatively distinct phenomenon. Thus, if measures of persistent poverty are to constitute an important component of EU social indicators, a strong case can be made for including parallel measures of deprivation persistence and continuing to explore the relationship between them.

Keywords: Poverty, Deprivation, Dynamic, Measurement error, Latent class analysis.

Comparing Poverty and Deprivation Dynamics: Issues of Reliability and Validity

Introduction

In recent years the availability of the European Community Household Panel (ECHP) has made it possible to undertake a comparative analysis of the relationship between income poverty and deprivation measures at both cross-sectional and longitudinal levels. Interest in exploring this relationship has been stimulated, as Perry (2002) notes in a recent review of the literature, by the observation that there is a significant mismatch between poverty measured indirectly using an income approach and direct measures focusing on life-style deprivation. As has been recognised for sometime, this presents a challenge to the use of relative income poverty lines when identifying those excluded from a minimal acceptable standard of living through a lack of resources.[1] The issue raised here is one of validity i.e. whether it is reasonable to interpret relative income measures as adequately capturing such exclusion. Our starting point in this paper is the finding by Whelan *et al* (2004) that even where we employ longitudinal measures income poverty and deprivation appear to be tapping different phenomena. Our objective is to establish the extent to which this conclusion may be affected by the fact these dimensions are differentially affected by measurement error.

As Moisio (2004: 55) notes it has become a good deal less common to think of validity in purely statistical terms and attention is most frequently focused on construct validity and the need to provide a conceptual justification of the measure employed locating it in relation to alternative measures and conceptual frameworks. In the case of income poverty measurement such efforts have led to increased focus on both multi-dimensional and longitudinal measurement. In this paper we wish to consider the possibility that by paying appropriate attention to the longitudinal aspect we may avoid the need for multidimensional measurement suggested by the observed mismatch between income poverty and deprivation apparent at the cross-sectional level. A particularly strong version of the hypothesis that the key to resolving these issues lies in using longitudinal measures is that of Gordon (2002:15) who suggests that different measures tap the same dynamic process but in its different phases. Without going this

far we might expect that by measuring poverty and deprivation over time we could make significant progress in reducing the mismatch associated with point in time measures. Panel research has shown that movements into and out of poverty are a great deal more frequent than had been supposed and

[1] See (Ringen 1987; Ringen 1988)

that a far greater proportion of the population experience poverty at some point than revealed by cross-sectional studies (Layte & Whelan 2003). By extending our measure of income poverty over time, we might hope to get a better measure of permanent income or command of resources. Our expectation would then be that such a measure would be more strongly related to deprivation and would contribute to a reduction in the income poverty-deprivation mismatch. Implicit in this approach is the assumption that deprivation measures are more stable than income measures and thus that current level of deprivation is a significantly better indicator of persistent deprivation than current income is of its longitudinal counterpart. Given this, the mismatch problem, evident at the cross-sectional level, would be largely resolved by taking poverty experience over time into account.

A recent analysis by Whelan *et al* (2002) sought to test these hypotheses using the first five waves of the ECHP. Their findings turned out to be remarkably stable across the nine countries included in their analysis. In each case a measure of extent of exposure to poverty over the five-year spell offered significant advantages over its cross-sectional counterpart. An income poverty profile schema that differentiated respondents in terms of their degree of exposure was shown to be systematically related to both cross-sectional and longitudinal deprivation. However, contrary to expectations, the level of mismatch at the longitudinal level was no less than for point-in-time measures.

Thus even where we are in a position to observe both income poverty and life-style deprivation over a reasonable period of time the evidence points to the conclusion that, while there is a substantial correlation between these dimensions, they are to a significant extent tapping different phenomena. Thus, if poverty continues to be defined in terms of "exclusion from a minimally acceptable standard of living through a lack of resources" it is necessary to conclude that even longitudinal measures of income poverty cannot be taken on their own as providing valid measures of the underlying construct and it remains necessary to take into account direct measures of deprivation. However, one factor that has not been taken into account in earlier analyses is the role of measurement error. This is not unusual and indeed Breen and Mosio (forthcoming) could find only one effort prior to their own by Rendtel *et al* (1998) that developed a model to distinguish between true poverty mobility and measurement error. As they note, conclusions about poverty dynamics drawn on the basis of observed data implicitly assume a saturated structural model and a measurement model that assumes exact correspondence between observed poverty and true poverty. Studies of this kind based on the ECHP have shown generally show high levels of mobility into and out of poverty with a much larger proportion of the population experiencing poverty at some point during the period of observation than suggested by the cross-sectional figures. At the same time the incidence of poverty is concentrated in the same

part of the population (Layte and Whelan, 2003, Whelan *et al* 2004). As Breen and Moisio (forthcoming) note, these two aspects of poverty dynamics seem to surface in one form or other in most studies of the phenomenon. [2]

While there is a remarkable consistency in such findings, recent studies that have taken measurement error in account produce a strikingly different picture. As Moisio (2004:58) notes, measurement error in relation to income poverty can arise for a variety of reasons. The respondent may report erroneous information relating to either income components or household composition. Surveys request income over a fixed period such as the previous year and respondents may have different perceptions of time in relation to income. The meaning of 'household' may be misunderstood. Finally there may be sources of income that the respondent does not wish to reveal. With the measures of life-style deprivation we employ respondents are in most case asked to indicate not only the presence or absence of an item but in the case of absence whether this arises because of inability to afford the item. There are thus two distinct sources of error. Moisio (2004:59) notes that, while with cross-sectional measures we may reasonably assume that measurement errors cancel out each other, so that our estimates are unbiased if random errors are uncorrelated, this convenient attribute does not apply with repeated measures.

Rendtel *et al* (1998) using a latent Markov chain model reached the striking conclusion that almost half the observed poverty mobility in the German Socio-Economic Panel could be accounted for by measurement error. Basic *et al* (2004) extended such analysis by applying such models to a comparison of the first wave of the Finnish ECHP survey and corresponding administrative data and concluded that over-estimation of poverty transitions as a consequence of measurement error was a substantially more serious problem than errors in estimation associated with selective attrition.

Breen and Moisio (forthcoming) and Moisio (2004) apply a range of models of graduated complexity to income poverty dynamics in ten countries using four waves of the ECHP. These models range from a simple Markov model to a time-heterogeneous mover-stayer model that allows error in the measurement of the movers' states. The simple Markov chain model assumes that the state occupied at time t depends only on the state occupied at time t-1. The most parsimonious version restricts the two-way transition matrices to be stable across time while an alternative version allows for heterogeneity. Such models, which assume a homogeneous population, rarely provide a satisfactory fit. A mixed Markov model allows for more than one chain. The best known of such models is a mover-

[2] See Bane and Ellwood, 1986, Duncan *et al* 1993, Leisering and Liebfied, 199 and Whelan *et al* 2000).

stayer model where the transition probabilities in the second chain relating to the stayers are assumed to be either 1.00 or 0.0. The model thus assumes two underlying groups - one who are stable between successive years and another involving individuals who move in and out of poverty according to a simple Markov change process. This model takes no account of measurement error.

Such error can be taken into account by combining latent class and Markov chain modelling. Latent structure models were developed by Lazarsfeld and Henry (1968).as measurement models that relate, in a probabilistic, fashion, a discrete or continuous variable to the discrete scores or categories of manifest variables. Van de Pol and De Leeuw (186) used such models to estimate measurement errors in repeated nominal variables and provide a account of the location of measurement error.

The final model applied by Breen and Moisio (forthcoming), which provides the most satisfactory account of income poverty dynamics across the ten countries included in their analysis, is a latent mover-stayer model in which the movers' chain is allowed to be heterogeneous over time.[3] Applying this model they confirm the earlier result of Rendtel *et al* (1998, 2004) that mobility in income poverty dynamics is overestimated by between 25 and 50 per cent if measurement error is ignored. In this paper we wish to pursue the implications of these striking findings for earlier work concerning the relationship between income poverty persistence and deprivation persistence. This work has shown that these different forms of persistence display both distinct patterns of socio-economic variation and highly variable consequences for outcomes such as subjective economic strain (Whelan *et al* 2003, 2004). These results suggest that these measure are tapping somewhat different underlying dimensions. If, however, it were the case that deprivation persistence was measured with much greater accuracy than was the case for income persistence then a significant part of the observed difference might derive from differential reliability.

In the analysis that follows we will seek to explore these issues by applying the heterogeneous latent mover-stayer model to both income poverty and deprivation dynamics for the range of countries for which such information is contained in the User Data Base (UDB) of the ECHP.[4] Moisio (2004) has applied this model and others to a housing deprivation index in the ECHP and found support for the existence of a common pattern of fluidity at the latent but not at the observed level. However, in the

[3] For an account of the full range of models applied by Breen and Moisio (fortcoming) and the corresponding LEM syntax (Vermunt, 1997) see Moisio (2004).

[4] We have also fitted the time heterogeneous latent class and latent Markov models described in Breen and Moisio (forthcoming) and Moisio (2004), however as in their case these models provided less satisfactory fits the observed data.

earlier analysis of Whelan *et al* (2003, 2004) housing items were deliberately excluded from the deprivation index employed. Such items have been found to form a quite distinct cluster to those included in the Current Life Style Deprivation (CLSD) index employed by Whelan *et al*. and to have significantly weaker correlations with income.[5] Given the role of life-cycle variables and the influence of factors such as the balance of private sector versus public sector provision, the weak association of housing deprivation with income is not surprising and we therefore argue that the mismatch between income and this form of deprivation does not constitute the same kind of problem with regard to construct validity as that involving measures such the CLSD indicator that we propose to employ in our subsequent analysis.[6]

Data and variables

The results presented in this paper are based on the ECHP User Data Base (UDB) containing data from waves one to five (1994 to 1998) as released for public use by Eurostat.[7] The income measure employed is total annual disposable household income, including transfers and after deduction of income tax and social security contributions, with the household taken as the income recipient unit. In using total annual income of the previous year, as we do in this paper, one concern one might have is about the possible discrepancy between the time (t-1) the income refers to and the time of the interview (t). One solution to this problem could be to match retrospectively the total annual income from the following wave at t +1 with the current wave (t) and to repeat this operation for the successive waves.[8] However in this case one is also confronted to the problem that some household characteristics might have changed between t and t+1, so the income taken from the following wave at t +1 might not necessarily coincide with the same household characteristics at t time as it does at t +1. In addition one must jettison the income data from the first wave. For this reason in this paper we prefer to use the total annual household income reported within each wave and to use it with the current household characteristics available in the same wave as given by Eurostat.

[5] For discussions concerning the dimensionality of deprivation sees Dewilde, 2004, Perez-Mayo, 2003 and (Whelan, Layte, Maître, & Nolan 2001).
[6] The distinctive character of housing deprivation is also confirmed by Moisio's (2004:114) analysis where observed exit rates are remarkably high.
8 For a discussion of the quality of the ECHP data see Wirz and Meyer (2002).
[8] This is the solution adopted by Breen and Moisio (forthcoming).

We employ the "modified OECD" equivalence scale where the first adult in a household is given the value 1, each additional adult is given a value of 0.5 and each child a value of 0.3.[9] The equivalised income of the household is attributed to each member, assuming a common living standard within the household.

While household income is used as the income concept, following standard procedures, the individual is chosen as the unit of analysis.[10] The individual is preferred to the household because the latter is not a stable entity over time since family composition often changes fundamentally over the years for various reasons, such as birth and death, leaving home, divorce or separation and marriage and remarriage. In our analysis of dynamics we use a balanced panel of 'survivors' who remained in the sample from 1994 to 1998 and use the 'base weight' as a longitudinal weight for this group as specified by Eurostat.[11] Although the full ECHP UDB data file includes data for fifteen countries the data required for our analysis is available for only nine countries. For these nine countries the total number of individual respondents in the first wave was with 139,358 with 95,213 being available for analysis across the five waves from 1994-1998. [12]

For the purposes of the analyses in this paper, we identified thirteen household items, which could serve as indicators of the concept of life-style deprivation, understood as involving being denied the opportunity to obtain goods, facilities and opportunities to participate in a manner generally identified as appropriate in the relevant community. The items included in the scale are considered to cover a range of what we term Current Life-Style Deprivations (CLSD). The format of the items varied, but in each case we seek to use measures that can be taken to represent enforced absence of widely desired items. [13]

Respondents were asked about some items in the format employed by Mack & Lansley (1985): for each household it was established if the item was possessed/availed of, and if not a follow-up question asked if this was due to inability to afford the item. The following six items took this form:

- A car or van.
- A colour TV.

10 The level of measured income inequality can vary depending on the choice of equivalence scale (see e.g. (Buhman et al. 1988)).
[10] See (Muffels & Fouarge2003)
[11] For a discussion of attrition in the ECHP see (Watson 2003)
[12] For a discussion of the quality of the ECHP data see (Eurostat 1999b; Eurostat 1999a; Watson & Healy 1999) and (Wirz & Mejer 2002)
14 Full details of the CLSD measure and of other dimensions of deprivation in the ECHP data-set are provided in (Whelan, Layte, Maître, & Nolan2001)

- A video recorder.
- A micro wave.
- A dishwasher.
- A telephone.

In these cases we consider a household to be deprived only if absence is stated to be due to lack of resources.

For some items the absence and affordability elements were incorporated in one question, as follows: “There are some things many people cannot afford even if they would like them. Can I just check whether your household can afford these if you want them”. The following six items were administered in this fashion:

- Keeping your home adequately warm.
- Paying for a week’s annual holiday away from home.
- Replacing any worn-out furniture.
- Buying new, rather than second hand clothes.
- Eating meat chicken or fish every second day, if you wanted to.
- Having friends or family for a drink or meal at least once a month.

The final item relates to arrears; we consider a household as experiencing deprivation in terms of this item if it was unable to pay scheduled mortgage payments, utility bills or hire purchase instalments during the past twelve months. An index based on a simple addition of these thirteen items give a reliability coefficient of 0.80.

We use a weighted version of this measure in which each individual item is weighted to the proportion of households suffering an enforced lack of that item in each country. The weighted CLSD measure makes it possible to identify for each country, and for each income poverty line, a corresponding deprivation threshold where the proportions of persons in income poverty and in deprivation are the same. For example if in the Netherlands 20% of persons are below the 70% income poverty line we calculate a deprivation threshold identifying the 20^{th} % of persons the most deprived on the weighted CLSD measure. This allows for the mismatch between poverty defined in income and deprivation terms to vary from zero to one hundred per cent.

We have chosen to focus on the 70% median income line. Given that our analysis covers five years, opting for a lower threshold would create difficulties arising from sparse observations in a number of cells of the five-way transition table, particularly those involving persistent income poverty. Thus in Breen and Moisio's (forthcoming) analysis of the four waves of the ECHP in only one case did the percentage falling below this line in all four years exceed ten per cent and in only three out of ten did it exceed seven per cent. For five waves these rates will necessarily be lower. In most countries this problem is even greater if we focus on deprivation.

Observed Income poverty and Deprivation Dynamics

Before proceeding to model poverty and deprivation dynamics we provide an account of the observed patterns. In Table 1 we set out the cross-sectional poverty rates for the balanced panel. We can see that poverty dynamics during the first five waves took place in the context of relatively little variation in the cross-sectional rates. In the first wave the rate varied from 14.5% in Denmark to 29.2% in Portugal. Between the first and fifth waves the rate increase by 4% in Denmark and declined by 3% in Spain, otherwise variation was extremely modest and obviously plays a modest role in structuring poverty dynamics.

Table 1: Observed income poverty rates in each wave

	Poverty rates			
	1994	1995	1996	1997
Denmark	14.5	14.7	15.2	16.8
Netherlands	19.7	18.7	18.3	17.5
Belgium	23.1	22.8	21.7	21.0
France	22.1	21.0	21.3	20.7
Ireland	24.4	27.2	28.9	26.7
Italy	26.8	25.9	27.0	26.8
Greece	27.4	27.3	27.0	27.9
Spain	28.8	26.4	25.2	26.9
Portugal	29.2	30.2	30.4	29.9
Average	24.0	23.8	23.9	23.8

In Table 2 we show the percentage classified as poor N times out 5 for both income poverty and deprivation. The proportion exposed to poverty at any point during the five years ranged from 31.4% in Denmark to 48.6% in Portugal. As with earlier work there is a remarkable uniformity in the ratio of the "ever-poor" figure to the poverty rate in the first wave. The observed values all lie in the narrow range running from 1.62 in Denmark to 1.83 in Ireland. The proportion exposed to poverty in all five waves

ranges from 5.7% in Denmark to 13.7% in Portugal. The "always poor" rate ranges between approximately one-third and less than one half of the cross-sectional rates. The figures for deprivation persistence are very similar to those for income poverty. Thus the percentage exposed to poverty on at least one occasion ranges from 34% in the Netherlands to 47% in Ireland. The average difference between the poverty and deprivation figures is of the order of three per cent. Similarly the proportion experiencing poverty in all five years ranges from 3.9% in Denmark to 14.7% in Portugal, with average difference between the poverty and deprivation figures being less than two per cent.

Table 2: Proportion classified as poor and deprived N times out of five

	0/5	1/5	2/5	3/5	4/5	5/5
			Poverty			
Denmark	68.6	11.8	6.5	3.3	4.1	5.7
Netherlands	66.4	10.9	6.3	5.0	4.8	6.6
Belgium	60.3	12.4	7.3	5.6	5.6	8.9
France	62.5	11.8	6.2	4.7	6.0	8.8
Ireland	56.4	9.5	8.0	6.5	8.4	11.2
Italy	53.3	13.5	9.0	7.0	7.5	9.8
Greece	51.5	13.3	9.0	8.7	7.7	9.8
Spain	53.4	11.7	9.7	8.2	7.0	9.8
Portugal	51.4	11.6	9.2	6.8	7.2	13.7
Average	58.2	11.8	7.9	6.2	6.5	9.4
			Deprivation			
Denmark	66.4	14.2	8.3	4.6	2.7	3.9
Netherlands	65.9	10.9	5.9	4.8	4.9	7.6
Belgium	54.2	18.9	7.9	5.5	5.2	8.2
France	60.0	13.0	7.1	6.5	5.8	7.7
Ireland	53.0	12.7	8.7	8.6	6.7	10.4
Italy	48.4	17.1	11.4	8.0	8.3	6.8
Greece	44.7	18.0	12.2	9.8	8.4	6.9
Spain	50.9	14.7	9.8	8.9	7.9	7.9
Portugal	50.5	12.8	8.4	6.7	6.9	14.7
Average	54.9	14.7	8.9	7.0	6.3	8.2

As in the case of the earlier analysis by Breen and Moisio (forthcoming), while poverty spells are generally of short duration the risk of poverty recurring remains persistently high. From Table 3 we can see that, given that one is income poor in wave one, the risk of poverty recurring declines very modestly across the five waves. Thus on average in wave two the conditional probability was 0.69 and

by the fifth wave it was still as high as 0.59.[14] So relatively modest overall risks of uninterrupted poverty go together with high levels of recurrence. The results for deprivation are remarkably similar with the conditional risk of being above the deprivation threshold in the second wave being 0.64 with a modest decline to 0.57 by wave five. Overall the observed poverty and deprivation mobility patterns, rather than suggesting greater stability and persistence for the deprivation dimension reveal remarkably similar patterns for both variables. In the section that follows our focus shifts from observed to the latent patterns.

Table 3: Risk of poverty and deprivation in subsequent waves after being poor/deprived in wave 1

	P(2/1)	P(3/1)	P(4/1)	P(5/1)
		Poverty		
Denmark	62.0	57.7	54.0	61.7
Netherlands	68.6	61.5	59.0	51.1
Belgium	67.0	62.6	62.1	61.0
France	66.0	63.8	60.2	58.9
Ireland	75.9	72.1	67.4	64.6
Italy	67.2	65.1	62.6	56.0
Greece	66.6	63.9	62.1	58.0
Spain	67.0	59.3	59.5	58.2
Portugal	77.5	68.9	66.9	62.5
Average	68.7	63.9	61.5	59.1
		Deprivation		
Denmark	53.1	49.5	48.4	50.0
Netherlands	68.0	66.0	61.1	55.7
Belgium	64.2	60.4	58.3	55.0
France	65.7	64.6	61.3	61.4
Ireland	70.6	71.6	65.8	64.3
Italy	61.7	56.2	51.1	48.8
Greece	55.7	52.2	51.1	53.5
Spain	65.2	60.5	59.8	63.3
Portugal	72.8	65.4	66.7	61.2
Average	64.1	60.7	58.2	57.0

[14] Throughout this paper when we report averages they are simply the mean of the reported country values our objective is not calculate some weighted European figure but simply to provide a reference point for results relating to individual figures.

Modelling Income Poverty Deprivation and Dynamics

Following Breen and Moisio (forthcoming), in modelling income poverty and deprivation dynamics we attempt to improve on the goodness of fit of a simple Markov model by taking account of population heterogeneity and measurement error. The former is accommodated through a mixed Markov model specified as follows:

[1] $$F_{ijklm} = N\sum_{s=1}^{s}\pi_s\delta_{si}\tau_{s,j|i}\tau_{s,k|j}\tau_{s,l|k}\tau_{s,m|l}$$

This specifies several Markov processes or chains (indicated by s=1,...,S). The expected frequency is now a sum over these processes, and the new parameter, π_s , indicates the proportions of the sample in each of the S chains. The simple Markov model arises when S=1, but for S >1 the membership of the different chains is defined by latent classes. Another important special case of this model arises when S=2 and, for one of the processes, $\tau_{j|i} = 1$ if state j = state i, 0 otherwise, and similarly for all the other transition probabilities. This is the classic mover-stayer model that specifies that there are two non-mover groups, one never in poverty and one always in poverty and an additional group of movers whose pattern of transitions follow a Simple Markov chain in which the state occupied at time t depends only on the state occupied at time t-1. The time heterogeneous version of this model allows the poverty transition probabilities of the mover group to vary over time.

Equation 1 is a model of the number of individuals with a sequential history of being in state i, followed by sate j, followed by state k, followed by state l, followed by state m. The equation therefore tells us what fraction of people there are of the various types, what fraction of each type stated in state I, and then what the state dependent transitions are of making these various transitions

Measurement error can be captured through a latent class formulation by assuming that to each observation of the states (manifest variable) there corresponds a latent variable that measures the true distribution over the state. These latent variables are completely specified by the size of the latent classes and the probabilities of being observed in a given manifest class conditional on being in a given latent class. This model can be written as

[2] $$F_{ijklm} = N\sum_{a=1}^{A}\sum_{b=1}^{B}\sum_{c=1}^{C}\sum_{d=1}^{D}\sum_{e=1}^{E} \delta_a \rho_{i|a} \delta_b \rho_{j|b} \delta_c \rho_{k|c} \delta_d \rho_{l|d} \delta_e \rho_{m|e}$$

The latent variables are denoted a=1,...,A, b=1,...,B, c=1,...,C, d=1,…,D and e=1,…E. The distribution of each latent variable is given by δ and the relationship between the observed variables I, J, K,L and M and their latent counterparts, A, B, C,D and E is described by the conditional response probabilities ρ. The closer the response probability matrix is to an identity matrix (i.e. $\rho_{manifest|latent}$ =1 when the latent and manifest states are the same, 0 otherwise) the smaller is the measurement error of the variable. These ρ parameters can thus be interpreted as measures of reliability.

Finally we can combine this measurement model with the time-heterogeneous mover-stayer model. This model is specified as follows:
[2]

$$F_{ijklm} = N\sum_{s=1}^{S}\sum_{a=1}^{A}\sum_{b=1}^{B}\sum_{c=1}^{C}\sum_{d=1}^{D}\sum_{e=1}^{E} \pi_s \delta_{sa} \tau_{s,b|a} \tau_{s,c|b} \tau_{s,d|c} \tau_{s,e|d} \rho_{s,i|a} \rho_{s,j|b} \rho_{s,k|c} \rho_{s,l|d} \rho_{s,m|e}$$

where the expected frequency *F* in the *i, j, k,l , m*th cell of the five-way transition table is presented as a function of the sample size N, initial probabilities δ and transition probabilities τ. The latent variables are denoted a=1,...,A, b=1,...,B, d=1,...,D, and e=1,…,E. The distribution of each latent variable is given by δ and the relationship between the observed variables *I, J, K, L* and *M* and their latent counterparts, *A, B, C, D* and *E* is described by the conditional response probabilities ρ. The closer the response probability matrix is to an identity matrix (i.e. $\rho_{manifest|latent}$ =1 when the latent and manifest states are the same, 0 otherwise) the smaller is the measurement error of the variable. These ρ parameters can thus be interpreted as measures of reliability. The τ's now indicate the transition probabilities between the latent variables. So this latent Markov model contains the structural model and a measurement model. The stayers are assumed to be measured without error and the reliabilities for the movers are constrained to be time homogeneous.

In Table 4 we show the fit for the time-heterogeneous mover-stayer model that allows transition probabilities to vary over time and for error in the measurement of movers' states but constrains such error to be constant over time. This model is applied to both income and deprivation dynamics for the

nine countries included in our analysis. This model has 18 degrees of freedom For each country, for both income poverty and deprivation dynamics, we report the likelihood ratio chi square for goodness of fit (G^2), the reduction over the independence model G^2 and the dissimilarity index (Δ) or percentage of cases misclassified.

Table 4: Fit statistics for HLMS Model and percentage reduction in G^2 from independent model

	Income			Deprivation		
	G^2	Δ	rG^2	G^2	Δ	rG^2
Denmark	88.2	2.7	98.4	55.9	2.2	98.3
Netherlands	72.7	1.7	99.4	75.6	1.8	99.4
Belgium	137.7	2.5	98.6	81.0	2.5	99.0
France	66.0	1.3	99.7	40.5	1.2	99.8
Ireland	153.2	3.0	99.0	111.1	2.6	99.1
Italy	93.2	1.9	99.6	135.3	2.2	99.2
Greece	84.4	1.9	99.5	83.6	2.1	99.2
Spain	210.4	2.4	99.0	119.9	2.2	99.3
Portugal	214.2	2.4	99.0	360.8	3.8	98.4

The extent of mismatch of the independence model provides an index of the strength of the association in the transition tables that requires explanation. Focusing first in income poverty dynamics, we find that the time heterogeneous mover-stayer model accounts for between 98.4% and 99.7% of the independence deviance with the G^2 varying between 88.2 in Denmark and 214.2 in Portugal. The percentage of cases misclassified varies between 1.3% in France and 3% in Ireland. The findings relating to deprivation dynamics are remarkably similar. The model accounts for between 98.3 and 99.8% of the independence model deviance with the G^2 varying between 55.9 in Denmark and 360.8 in Portugal. The percentage of cases misclassified ranges from 1.2% in France to 3.8% in Portugal. Thus consistent with the earlier work of Breen and Moisio (forthcoming) and Moisio (2004), our preferred model provides a generally satisfactory account of both income poverty and deprivation dynamic.

The fact that income poverty and deprivation dynamics obviously share some general characteristics is an interesting finding. However, in order to further explore their differences and similarities we need to focus on the parameters of the model. In Table 5 we set out, for both types of dynamics, the size of the mover/stayer classes and the proportion poor/deprived in wave 1. For income poverty the proportion of movers varies between 0.40 in Denmark to 0.60 in Greece with a tendency for stayers to be a minority in Northern European countries and a majority in Southern European countries such as Italy, Spain, Greece and Portugal. In the case of deprivation the mover rates are higher in seven out of the

nine countries. The mover rates range from 0.42 in the Netherlands to 0.70 in Belgium. On average the proportion of movers is higher for deprivation than income poverty with the respective figures being 0.57 and 0.51. In both cases the mover rate is higher in the South than in the North with the figures for the former being 0.56 and 0.60 respectively for poverty and deprivation compared to 0.47 and 0.54. Thus stability is generally greater for poverty and deprivation in the Northern countries. However, the vast majority of estimates are located in a relatively narrow range.[15]

[15] This finding contrasts with the results reported by Moios (2004) employing four waves and the a threshold of sixty per cent of median income.

Table 5: Class size of movers/stayers for income poverty/deprivation and initial proportion of non-poverty/non-deprivation

		Class size for income poverty	Proportion poor in wave 1	Class size for deprivation	Proportion deprived in wave 1
Denmark	Mover	0.40	0.23	0.51	0.31
	Stayer	0.60	0.01	0.49	0.07
Netherlands	Mover	0.46	0.35	0.42	0.36
	Stayer	0.54	0.05	0.58	0.09
Belgium	Mover	0.51	0.37	0.70	0.24
	Stayer	0.49	0.13	0.30	0.19
France	Mover	0.49	0.36	0.52	0.34
	Stayer	0.51	0.08	0.48	0.10
Ireland	Mover	0.48	0.38	0.57	0.32
	Stayer	0.52	0.10	0.43	0.18
Italy	Mover	0.56	0.37	0.66	0.32
	Stayer	0.44	0.10	0.34	0.01
Greece	Mover	0.60	0.41	0.66	0.37
	Stayer	0.40	0.16	0.34	0.08
Spain	Mover	0.50	0.51	0.58	0.41
	Stayer	0.50	0.13	0.42	0.10
Portugal	Mover	0.59	0.35	0.50	0.42
	Stayer	0.41	0.24	0.50	0.21
Average	Mover	0.51	0.39	0.57	0.35
	Stayer	0.49	0.08	0.43	0.09

Focusing on initial poverty and deprivation rates for movers and stayers, we find that such rates are substantially higher for the former. In the first wave the average poverty rate for movers is 0.37 compared to that of 0.11 for stayers. An almost identical position is observed for deprivation with the corresponding outcomes being 0.35 and 0.11. Clear North-South differences in initial poverty rates are found for both movers and stayers. For the latter the respective figures are 0.07 and 0.16 and for the former 0.34 and 0.41. Thus North-South differences in latent poverty rates are influenced both by the relative proportion of movers and stayers and differences in the initial poverty risk. For deprivation, however, the latter factor plays somewhat less of a role in South-North difference. Initial deprivation is on average higher for movers than stayers with the respective figures being 0.39 and 0.31. However, for stayers the initial poverty rate in Northern countries is actually higher than its Southern counterpart, the respective figures being 0.13 and 0.10.

Estimated Proportions of True Stability and Change

Before focusing on the relative importance of different types of error, we shall first address the issue of overall levels of manifest and latent movement and stability. We do so by partitioning observed change and stability into true and error components using the parameter estimates of the time heterogeneous mover-stayer model. Using the terminology of Langeheine and Van de Pol (1990) the total proportion of stability (TOS) is the proportion of cases remaining in their original state throughout the observation period, expressed as a proportion of the total sample. This includes all those in the stayer categories who are assumed to exhibit perfect stabilities (PS). Hence TOS indicates true stability. TRS or 'true observed stability' can be thought of as the proportion of TOS that is observed as stability. The difference between TOS and TRS is error. Observed change can be deconstructed in a similar fashion. Total change (TOC) indicates true change and it can be calculated as 1- (TOS + PS). TOC can be partitioned into true observed change TRC and error. TRC is the proportion of true change TOC that is observed as such. By comparing TRS and TRC to TOS and TOC we can estimate how much error increases the observed estimates of mobility in our poverty and deprivation transition tables.

In Table 6 we show the results of these calculations. The forst two columns show observed stability (OBS) and observed change (OBC). The proportion of true stable cases that the model estimates is equal to perfect stability plus total observed stability (PS + TOS). In the vast majority of countries observed levels of stability and change for poverty and deprivation are similar, although the poverty stability rate is generally higher. The average level of observed stability is 0.67 for poverty and 0.63 for deprivation. For both indicators rates of stability are higher for the Northern countries with the

respective figures being 0.71 and 0.68 compared to 0.63 and 0.58. Comparing observed with latent rates, we find that in every case levels of stability increase significantly when measurement error is taken into account. In other words the level of mobility is consistently overestimated. Thus the average levels of latent stability for poverty and deprivation respectively are 0.81 and 0.82, with the difference that was found at he observed level disappearing. For both poverty and deprivation the Northern stability rates remain higher with the respective figures being 0.84 and 0.77 and 0.85 and 0.80.

Table 6: Estimated Proportions of True Stability and Change and Poverty/Deprivation Rate in the Poverty/Deprivation Transition Tables

		OBS	OBC	Perfect stability	TOS	TRS	error	TOC	TRC	error	Perfect stability + TOS	Perfect stability stability + TRS
Denmark	Income	0.74	0.26	0.60	0.28	0.14	0.14	0.13	0.07	0.06	0.88	0.74
	Deprivation	0.70	0.30	0.49	0.27	0.17	0.09	0.24	0.09	0.15	0.76	0.66
Netherlands	Income	0.73	0.27	0.54	0.32	0.19	0.13	0.14	0.08	0.07	0.86	0.73
	Deprivation	0.73	0.27	0.58	0.30	0.15	0.16	0.12	0.05	0.07	0.88	0.73
Belgium	Income	0.69	0.31	0.49	0.37	0.19	0.18	0.14	0.06	0.08	0.86	0.68
	Deprivation	0.63	0.38	0.30	0.57	0.32	0.25	0.13	0.06	0.08	0.87	0.62
France	Income	0.7	0.3	0.51	0.33	0.20	0.13	0.17	0.10	0.07	0.84	0.71
	Deprivation	0.7	0.3	0.48	0.40	0.18	0.22	0.11	0.04	0.07	0.88	0.66
Ireland	Income	0.7	0.3	0.52	0.23	0.15	0.08	0.25	0.16	0.09	0.75	0.67
	Deprivation	0.63	0.37	0.43	0.42	0.20	0.22	0.15	0.05	0.10	0.85	0.63
Italy	Income	0.63	0.37	0.44	0.37	0.18	0.19	0.18	0.09	0.10	0.81	0.62
	Deprivation	0.55	0.45	0.34	0.43	0.20	0.23	0.23	0.11	0.12	0.77	0.54
Greece	Income	0.61	0.39	0.40	0.34	0.19	0.15	0.26	0.12	0.14	0.74	0.59
	Deprivation	0.52	0.48	0.34	0.40	0.16	0.24	0.27	0.10	0.16	0.74	0.50
Spain	Income	0.63	0.37	0.50	0.25	0.11	0.14	0.24	0.10	0.14	0.75	0.61
	Deprivation	0.59	0.41	0.42	0.46	0.16	0.30	0.12	0.04	0.08	0.88	0.58
Portugal	Income	0.65	0.35	0.41	0.35	0.23	0.12	0.24	0.13	0.11	0.76	0.64
	Deprivation	0.65	0.35	0.50	0.29	0.14	0.15	0.21	0.10	0.11	0.79	0.64

For income poverty, in every case the observed stability is below the true rate. The level of error ranges from 12% in Portugal to 19% in Italy and the true level of stability ranges from 74% in Greece and Ireland to 88% in Denmark compared to an observed range going from 61% to 74%. In every case

perfect stability plus TRS equals or comes close to observed stability with the average percentage difference being less than one per cent. Thus almost all unsystematic error is observed as change. While the observed results suggest levels of change in Denmark and Greece of 26% and 39% respectively, the corrected estimates indicate levels of 13% and 26% respectively. Since the correction for error is always in the same direction, the pattern whereby more change is observed in the Southern than Northern European countries is maintained, although Ireland moves nearer to the Southern pattern.

The pattern for deprivation is remarkably similar. The observed level of stability ranges from 73% in the Netherlands to 52% in Greece while the corresponding figures for the corrected estimates are 88% in the Netherlands and 74% in Greece. Similarly, in each case perfect stability plus TOS equals or comes close to observed stability with the average difference equalling one per cent. Thus once again the vast bulk of error is counted as change. There is again a tendency for less change to be observed for the Northern European countries, although in this case Denmark constitutes an exception. Taking measurement error into account suggests that deprivation is more stable than income poverty in Ireland, Spain and Portugal. In Denmark and Italy the opposite is true and in Netherlands, Belgium, France and Greece there is little difference.

Distinguishing Types of Measurement Error

In fact, the more notable contrasts between income poverty and deprivation dynamics relate not to overall levels of mobility and stability but to difference in types of mobility and stability. The modal response probabilities in the diagonal of the reliability matrices set out in Table 7 provide separate estimates of reliability for the poor and the non-poor and deprived/non-deprived. Comparing the poor and non-poor we find that for the Northern European countries there is no clear pattern of differentiation between the types of reliability. Both range between 0.85 and 0.95 with the average level of misclassification being 0.13 for the poor and 0.10 for the non-poor. In Northern Europe excluding Belgium, which is something of an exception, the highest level of misclassification of non-poor as poor is 0.15 in Denmark and of poor as non-poor is 0.14 in the Netherlands and Italy. The Southern European countries display a somewhat different pattern with the level of reliability being significantly lower for poor as opposed to non-poor. Thus while the reliability levels for the former vary between 0.77 and 0.86 for the latter they are found in the range running from 0.86 to 0.95. In other words, while between 0.14 and 0.23 of those who are actually poor are misclassified as non-poor the corresponding

percentages for misclassification of the non-poor ranges between 0.05 and 0.14. The contrast is even sharper if we exclude Italy.

Table 7: Reliability rates for movers for income and deprivation

		Not poor	Poor	Not Deprived	Deprived
Denmark	Not poor/deprived	0.85	0.15	0.95	0.05
	Poor/deprived	0.05	0.95	0.37	0.63
Netherlands	Not poor/deprived	0.91	0.09	0.88	0.12
	Poor/deprived	0.14	0.86	0.20	0.80
Belgium	Not poor/deprived	0.92	0.08	0.91	0.09
	Poor/deprived	0.26	0.74	0.24	0.76
France	Not poor/deprived	0.91	0.09	0.89	0.11
	Poor/deprived	0.12	0.88	0.26	0.74
Ireland	Not poor/deprived	0.91	0.09	0.90	0.10
	Poor/deprived	0.08	0.92	0.29	0.71
Italy	Not poor/deprived	0.86	0.14	0.85	0.15
	Poor/deprived	0.14	0.86	0.11	0.89
Greece	Not poor/deprived	0.94	0.06	0.85	0.15
	Poor/deprived	0.23	0.77	0.21	0.79
Spain	Not poor/deprived	0.90	0.10	0.85	0.15
	Poor/deprived	0.23	0.77	0.28	0.72
Portugal	Not poor/deprived	0.95	0.05	0.87	0.13
	Poor/deprived	0.18	0.82	0.16	0.84

The pattern for deprivation dynamics is a good deal different. The average error level for the deprived is twice that for the non-deprived, with the respective figures being 0.24 and 0.12. This contrast is particularly striking in the five Northern European countries where the exit from deprivation error level is four times that of the corresponding entry to deprivation rate, with the respective figures being 0.27 and 0.07. Here we find that, while the error rates for the non-deprived range between 0.10 and 0.05, for the deprived they are significantly higher with a minimum value of 0.20 and a maximum of 0.37 . In the Southern European countries the differences are a good deal more modest with a rate of 0.19 for the deprived and one of 0.15 for the non-deprived.

Observed and Latent Income Poverty and Deprivation Persistence

A full discussion of the similarities and difference between income poverty and deprivation dynamics requires that we simultaneously take into account differences in the size of the latent mover-stayer classes, the initial poverty/deprivation rates, and corrected transition rates for stayers. All of these elements are reflected in the estimates, set out in Table 8, of the latent risk of being in poverty/deprivation in subsequent waves given that one is poor/deprived in wave one. These figures can be compared with the corresponding observed figure in Table 3. There we observed that persistence was somewhat stronger for income poverty than for deprivation. For the former the conditional poverty rates declined gradually from 0.69 in the second wave to 0.59 in the fifth wave, while for the latter the corresponding figures were 0.64 and 0.57. Having corrected for measurement error, however, we find the opposite is true. Thus the successive conditional rates of 0.84, 0.76. 0.70, 0.66 for income poverty are in each case lower than the corresponding deprivation rates of 0.86, 0.80, 0.73 and 0.69. France, Ireland and Spain are characterised both by very high levels of latent deprivation persistence and by larges gaps between the observed and latent values. However, with this exception, one is more struck by the level of uniformity across dimensions and countries than by differences.

Table 8: Latent risk of poverty/deprivation after poverty/deprivation in wave 1

	Latent Risk of poverty in subsequent waves after wave 1 in poverty				Latent Risk of deprivation in subsequent waves after wave 1 in deprivation			
	P(1/2)	P(1/3)	P(1/4)	P(1/5)	P(1/2)	P(1/3)	P(1/4)	P(1/5)
Denmark	0.78	0.70	0.70	0.70	0.76	0.67	0.57	0.58
Netherlands	0.86	0.75	0.66	0.57	0.86	0.82	0.74	0.63
Belgium	0.90	0.77	0.73	0.72	0.92	0.83	0.79	0.69
France	0.78	0.74	0.67	0.65	0.94	0.88	0.83	0.81
Ireland	0.85	0.80	0.71	0.67	0.99	0.97	0.84	0.83
Italy	0.85	0.78	0.72	0.63	0.79	0.71	0.61	0.52
Greece	0.84	0.77	0.72	0.67	0.73	0.64	0.62	0.60
Spain	0.81	0.70	0.69	0.63	0.96	0.90	0.88	0.87
Portugal	0.89	0.80	0.74	0.67	0.82	0.74	0.70	0.65
Average	0.84	0.76	0.70	0.66	0.86	0.80	0.73	0.69

In Table 9 we compare the distribution of observed and latent income poverty and deprivation distributions across time. However, in this case, rather than using a count of the number of years out of five in poverty, we have followed Fouarge and Layte (forthcoming) in constructing poverty profiles that allow us to examine both the persistence and recurrence of poverty by distinguishing between:

- The persistent non-poor – never poor during the accounting period
- The transient poor - poor only once during the accounting period.
- The recurrent poor – poor more than once but never longer than two consecutive years.
- The persistent poor – poor for a consecutive period of at least three consecutive years.

In the vast majority of cases the observed poverty and deprivation profiles are similar. This is also the case for the latent profiles. For both the poverty and deprivation profiles movement is substantially lower when account is taken of measurement error. The average level of persistent non-poverty is 58% for the observed level and 66%for the latent. The corresponding figures for deprivation are 55% and 67%. Persistence on the other hand is much higher at the latent than the observed level, with the respective figures for poverty and deprivation being 18% v 23% and 17% v 23%. It is the intermediate states of transient and recurrent poverty that are substantially overestimated. For poverty the observed level of 24% is twice that of the corresponding latent figure. For deprivation the gap is even wider with the respective observed and latent figures being 28% and 10%. Focusing on poverty we find that the

level of observed non-poverty persistence ranges from 69% in Denmark to 51% for Portugal. The corresponding range for the latent estimates is 81% in Denmark to 56% in Greece. The level of observed persistent poverty ranges from 11% in Denmark to 24% in Portugal compared to 11% and 30% for latent persistence. Combining the transient and recurrent categories we obtain observed figures ranging from 20% to 28% compared to latent figures of 8% to 16%.

Table 9: Latent and observed income and deprivation profiles

	Persistent non-poor	Transient poor	Recurrent poor	Persistent poor	Persistent non-deprived	Transient deprived	Recurrent deprived	Persistent deprived
Denmark	68.6	11.8	8.6	11.0	66.4	14.1	11.4	8.0
Denmark (Latent)	80.7	5.8	2.4	11.0	67.0	9.4	7.6	16.0
Netherlands	66.4	10.9	9.4	13.3	65.9	10.9	8.9	14.3
Netherlands (Latent)	75.2	3.8	4.7	16.3	76.1	3.4	2.4	18.1
Belgium	60.3	12.4	11.7	15.7	54.2	18.9	12.1	14.8
Belgium (Latent)	68.3	4.4	4.9	22.4	71.6	4.1	4.2	20.1
France	62.5	11.8	9.0	16.8	60.1	12.8	11.8	15.3
France (Latent)	70.5	6.3	3.5	19.7	71.4	3.5	3.0	22.1
Ireland	56.4	9.5	11.6	22.5	52.7	12.5	14.9	19.9
Ireland (Latent)	61.7	6.5	6.8	25.1	63.6	1.8	3.7	31.0
Italy	53.3	13.5	13.4	19.9	48.4	17.1	16.1	18.3
Italy (Latent)	66.7	4.5	5.3	23.6	66.5	6.9	5.7	20.9
Greece	51.5	13.3	14.9	20.2	44.7	18.0	19.1	18.1
Greece (Latent)	56.1	7.9	7.2	28.8	59.2	10.5	5.7	24.6
Spain	53.4	11.7	16.2	18.7	50.9	14.7	17.3	17.2
Spain (Latent)	58.1	7.1	9.0	25.8	64.9	4.8	4.3	26.0
Portugal	51.4	11.6	13.5	23.5	50.5	12.8	12.8	24.0
Portugal (Latent)	56.48	6.11	7.10	30.31	59.9	7.3	5.0	27.7
Average	58.2	11.8	12.0	18.0	54.9	14.6	13.8	16.7
Average (Latent)	66.0	5.8	5.7	22.6	66.7	5.7	4.6	22.9

The pattern for deprivation is broadly similar. At the observed level the proportion entirely avoiding deprivation ranges from 66% in Denmark to 45% in Greece. The corresponding figures corrected for

error are 76% in the Netherlands and 59% in Greece. Observed persistence levels run from 8% in Denmark to 24% in Portugal compared to their latent counterparts of 16% in Denmark and 31% in Ireland. Once again combining the categories involving movement, we find that the observed range of 20% in the Netherlands to 37% in Greece suggests much higher levels of deprivation dynamics than the corresponding latent figures of 6% for the Netherlands and 16% for Greece.

The overall profiles for both observed and latent are remarkably similar for both poverty and deprivation. The marginally higher level of persistence for poverty at the observed level disappears with correction for measurement error. Reflecting the pattern of reliability coefficients, some modest differences are observed between Northern and Southern countries. For the former the numerical superiority of the persistent poor over the persistently deprived at the observed level – 16% v 14% - is reversed at the latent level with the relevant figures being 19% v 21%. In the South, on the other hand, persistent poverty is higher at both observed and latent levels - 21% v 19% and 27% v 25%. Denmark it should be noted constitutes something of a deviant case. In the case of income poverty correcting for measurement error leads to a significant increase in persistence avoidance of poverty but to no change in the level of persistent poverty. In the case of deprivation, however, we observe precisely the opposite. The fact that measurement error has such radically different consequences for these dimensions is consistent with the fact that the relationship between income poverty and deprivation has generally been found to be exceptionally weak in Denmark. The other striking exception is Ireland where the reduction in the numbers mobile produced by correction for measurement error is substantially greater in the case of deprivation than income poverty. France and Spain also display les movement at the latent level for deprivation than for poverty. However, there is nothing in our findings to suggest that our conclusions regarding differences in the determinants and consequences of the different forms of deprivation would be affected if we could substitute the latent variables for the manifest.

Conclusions

In this paper we have sought to establish if earlier findings relating to the relationship between income poverty and deprivation persistence could be due to failure to take measurement error into account. These had suggested that different forms of persistence are tapping related but distinct dimensions that display somewhat different patterns of socio-economic variation and have significantly different consequences for outcomes such as subjective economic strain. Earlier work had also suggested that the pattern of relationships involving deprivation conformed much more closely to our prior notions of what we might expect from an indicator that is successfully tapping exclusion from a minimally acceptable standard of living due to lack of resources. Our objective in this paper has been to establish whether such findings could be accounted for by the fact that deprivation persistence was being measured with a great deal more accuracy than income persistence.

In order to address this question we applied a model of dynamics incorporating structural and error components. This model performs equally well in accounting for poverty and deprivation dynamics. Our analysis shows a general similarity between error corrected poverty and deprivation dynamics. In both cases all error is captured as change and we substantially overestimate mobility. Where differences do arise between poverty and deprivation patterns, the tendency to overestimate mobility tends to be greater in the case of deprivation rather than poverty. This is related to the fact that the proportion of movers tends to be significantly higher in the case of deprivation. In particular, total avoidance of income poverty is more frequent than the corresponding situation relating to deprivation.

Distinguishing between different types of reliability, we find that by far the largest component of error is associated with overestimation of probability of exiting from such states. There is some North-South variation with the differential between error rates for income poor and non-poor groups being a good deal sharper in the Southern European. Thus exit rates for the poor are particularly overestimated in these countries. The opposite holds true for deprivation with the tendency to overestimate exits from deprivation being somewhat higher in the Northern countries.

Focusing on poverty and deprivation profiles we observe remarkable similarity across dimensions at both observed and latent levels . In both cases levels of poverty and deprivation persistence are higher at the latent than the observed level. However, while in the South poverty is more persistent than deprivation at both observed and latent levels, in the North this pattern though found for the observed data is reversed at the latent level. However, there is no evidence that earlier results relating to the differences in the determinants of poverty and deprivation persistence are

a consequence of differential patterns of reliability, Taking measurement error into account seems more likely to accentuate, rather than diminish, the contrasts highlighted by earlier research. Since longitudinal differences relating to poverty and deprivation cannot be accounted for by measurement error, it seems that we must accept that we are confronted with issues relating to validity rather than reliability. In other words, although income poverty and deprivation are substantially correlated, even where we measure them over reasonable periods of time and allow for measurement error they continue to tap relatively distinct phenomenon. Thus if measures of persistent poverty are to constitute an important component of EU social indicators, as suggested by Atkinson et al (2002), a strong case can be made for including parallel measures of deprivation persistence and continuing to explore the relationship between them.

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