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Abstract

The burden of poverty in Italy is unevenly distributed among various household types; in particular, those with dependent children are characterized by much higher incidences rates. As a consequence Italian children are more likely to experience poverty with respect to the general population, hindering their effective inclusion in the Italian society. This paper analyses the determinants of the risk of poverty and severe material deprivation for households with dependent children in Italy for the period 2010-2013. The analysis is based on the EU-SILC survey. We consider three indicators: the at risk-of-poverty, the subjective poverty, and the severe material deprivation rates. We apply a dynamic random effects probit model with autocorrelated error separately to the analysis of each indicator to assess genuine state dependence after controlling for various structural characteristics of the households. A strong state dependence emerges, regardless of the considered poverty measure thus providing evidence of poverty persistence or poverty trap. We also find that household work intensity is fundamental to prevent household to fall into poverty and material deprivation.

Keywords: Risk of poverty, Subjective poverty, Severe material deprivation, Dynamic probit models, State dependence
JEL Classification: C23, I32, J13, J21

1. Introduction

In 2016 Eurostat estimates that 20.6% of the Italian population is at risk of poverty and 12.1% live in condition of severe material deprivation. Both figures are above the EU-28 general average, respectively equal to 17.3% and 7.5%. If we focus on the second, which is based on a threshold independent of the country's average income level, we note how Italy is worse off with respect to the largest EU countries: the severe material deprivation rate attains 5.5% in Spain, 4.4% in France and 3.7% in Germany. The burden of poverty is distributed unevenly across the Italian society: the divide between the North and the South is notorious. The situation differs widely also across different household types (Istat, 2014). Specifically, those with dependent children, especially if mono-parental, are characterized by much higher poverty incidence rates. This is of a special concern as poverty experienced by children can compromise their outcomes in future adult life (Del Boca, 2010). Apart from the mono-parental households, whose situation is difficult in almost EU countries, the situation of households with dependent children is worse in Italy with respect to other EU countries: for instance the severe material deprivation incidence is 40% higher than the general average for families with at least three children, while it is lower than the average for Germany (Eurostat data).

In this paper we study poverty and social exclusion in household with at least one dependent child residing in Italy. We focus on this country, not only for the mentioned high prevalences measured according to both at-risk-of poverty and severe material deprivation rates. Italy is experiencing a persistent very low fertility rate that, despite immigration from many different countries is causing a rapid aging of the population (Billari, 2008). Moreover, although before the economic downturn a debate started on the opportunity to

reform the social welfare and tax-transfer regime (proposing, among others, a 'guaranteed minimum income') to sustain people in poverty conditions, such as elderly, disabled individuals and their families, and parents with children (Aaberge et al., 2004), the system of social transfers is still not well targeted neither on the poor nor on households with children (Fabrizi et al., 2014). A closer understanding of poverty and social exclusion among households with children can provide useful insights for the country's future social policies.

In recent years, poverty literature focused on longitudinal poverty, analysing the characteristics of the households that are at risk of being permanently poor or socially excluded. Cappellari and Jenkins (2004), Poggi (2007), Biewen (2009), and Addabbo et al. (2015), for example, analyse persistent poverty in Europe. Regarding Italy specifically, we find the studies of Addabbo (2000), Baldini and Ciani (2011), Devicienti et al. (2014),Coppola and Di Laurea (2016) and the more recent work by Giarda and Moroni (2018). As other countries in the Mediterranean region of the EU (Greece, Spain, Portugal), Italy is characterized by high poverty persistency. We analyse poverty and social exclusion focusing on its dynamics trying to assess, not only the impact of households structural characteristics, position on the job market and life events, but mainly to assess the size of true state dependence.

We consider data from the EU-SILC sample survey and specifically the longitudinal sample based on the overlaps of the waves from 2010 through 2013.

With respect to other contributions in the literature (Giarda and Moroni, 2018) we consider alternative measures of poverty and social exclusion, as we think that poverty is a complex phenomenon and no single measure can effectively

capture its several dimensions. The at-risk-of-poverty (*ARP*) and severe material deprivation (*SMD*) rates are two prominent measures of poverty and social exclusion in the European Union. They are very different under many respects: the first is a relative headcount measure based on equivalized income and a national threshold defined as a fraction of the national median, while the second measures material deprivation defined according to a score calculated on a given set of items: income is not directly involved in measurement and threshold does not dependent on the average national income. Typically the two measures do not identify the same set of households as poor (Ayala et al., 2011; Hick, 2015). More in general, while at-risk-of-poverty rate makes reference to current income, the material deprivation rate is closely related to permanent income: Whelan and Maitre (2010) notes how the difference between the two rates is highest among the elderly segment of the population.

We also consider the subjective poverty (*SP*) rate: its definition is based on a question about the ability of the household *to make ends meet*. As such, the measure is based on a subjective evaluation of the economic status made by the respondent. This evaluation will be influenced both by current and permanent income (Whelan and Maitre, 2010), but also by the social capital (Guadagno et al., 2013) and the social environment. The burden of poverty in Italy is unevenly distributed among various household types; in particular, those with dependent children are characterized by much higher incidences rates. As a consequence Italian children are more likely to experience poverty with respect to the general population, hindering their effective inclusion in the Italian society. This paper analyses the determinants of the risk of poverty and severe material deprivation for households with

dependent children in Italy for the period 2010-2013. The analysis is based on the EU-SILC survey. We consider three indicators: the at risk-of-poverty, the subjective poverty, and the severe material deprivation rates. We apply a dynamic random effects probit model with autocorrelated error separately to the analysis of each indicator to assess genuine state dependence after controlling for various structural characteristics of the households. A strong state dependence emerges, regardless of the considered poverty measure thus providing evidence of poverty persistence or poverty trap. We also find that household work intensity is fundamental to prevent household to fall into poverty and material deprivation. The *SP* rate can be useful to overcome some of the problems involved by the adoption of a single threshold for the at-risk-of poverty rate in a country characterized by a large economic divide (Mogstad et al., 2007; Fabrizi et al., 2008; Whelan and Maitre, 2010).

Our econometric analysis is based on dynamic random effects probit models with autocorrelated errors that will be estimated separately for the three poverty measures mentioned above. The triplet composed *ARP*, *SP* and *SMD* rates offer measures of poverty from different angles and, to the purposes of this paper, it offers the opportunity to compare whether structural characteristics of the households, variables related to the labour market and life events, let alone the actual state dependence, act similarly or not on poverty measured in the three different ways.

The main research question we try to address is whether the degree of genuine state dependence is the same for the three poverty measures we consider. The same question applies to all the control variables (or poverty *risk factors*) that we include in the models.

The paper is organized as follows. Section 2 describes the poverty measures analysed. Section 3 presents the dataset, descriptive statistics and stylized facts. Random effects dynamic probit models used to estimate poverty persistence and determinants are presented in Section 4. Section 5 discusses the main findings and Section 6 concludes.

2. Alternative poverty measures

The ARP rate is defined as the fraction of people living with an equivalized income below a threshold defined to be 60% of the national median. Equivalized income is defined as the total disposable household income (after taxes and social transfers) divided by an equivalized household size calculated according to the modified OECD-scale. This is a standard equivalence scale to calculate the number of 'equivalent adults' in a household. Such a scale assigns weight 1.0 to the first adult; 0.5 to the second and each subsequent person aged 14 and over; 0.3 to each child under 14.

This measure of poverty has a long tradition, its calculation is based on a highly standardized methodology, it has a clear interpretation and strong policy relevance. Nonetheless it has been criticized under many respects, and, in the European Union has been complemented by other measures (Marlier et al., 2012; Kis and G´abos, 2015). Some criticisms, relevant to our analysis are those that follow. It is an unidimensional measure, that reduces poverty to the non-availability of an adequate income; moreover as the relevants that of the reference year, it neglects inter-temporal transfers and income smoothing. The definition of total disposable income has some limitations: for example, it includes the imputed rent of an owned house, but does not subtract the

mortgage interest paid as a negative component (Maestri, 2015), leading to an optimistic evaluation of the economic conditions of indebted households during the recent economic downturn. The equivalence scale can be questioned: for instance, Bishop et al. (2014) adopting a subjective equivalence scales approach present evidence that the modified OECD can underestimate economies of scales in households with two or more children. The threshold is based on the average national income; as a consequence comparisons are difficult over time as the threshold changes from year to year. The fact that the threshold is national makes the *ARP* rate unsuitable for cross-country comparison, but also for comparing regions within the same country, if characterized by large economic disparities.

In a country such as Italy, characterized by large regional divide, considering a unique threshold can be misleading as fairly different levels of economic well-being can be attained with the same income in different parts of the country. This has been explicitly recognized by a measure of poverty routinely calculated by ISTAT (Istat, 2014) and based on an *absolute* threshold defined in terms of consumption levels. With reference to 2013 (the last year considered in our analysis), for a household with two adults and two dependent children (aged between 0-3 and 4-10 respectively) this absolute threshold ranges from 1086 if the household is resident in a town in the South to 1534 if resident in metropolitan area of the North. The North-South divide appear to be more relevant than the difference between large cities and small towns. Regional poverty thresholds have already been considered in the past (Mogstad et al., 2007; Fabrizi et al., 2008). Nonetheless, this solution can be criticized as completely masking regional inequality and defining poverty

exclusively in terms of distance from the center of the distribution instead of deprivation (Spicker, 2012).

To overcome these limitations we consider two other poverty measures: the (severe) material deprivation and the subjective poverty rates. Material deprivation is chosen as it is a multidimensional poverty measure more oriented to the actual standard of living instead of the income levels, while the recourse to subjective poverty is mainly motivated by its being free from the choice of a unique threshold.

As for the *ARP*, we take these indicators and related concepts as they are defined within the framework of the EU-SILC survey (Fusco et al., 2010).

Material deprivation is defined using a battery of nine household level questions with yes/no answer, each focused on measuring the ability/inability to afford items considered by most people to be desirable or even necessary to reach an adequate standard of living. The items are: 1) coping with unexpected expenses; 2) one week's annual holiday away from home; 3) avoiding arrears (in mortgage or rent, utility bills or hire purchase instalments); 4) a meal with meat, chicken, fish or vegetarian equivalent every second day; 5) keeping the home adequately warm; 6) a washing machine; 7) a colour TV; 8) a telephone; 9) a personal car. A deprivation score ranging from 0 to 9 is calculated counting the number of items an household cannot afford. A person is said to be severely materially deprived if he/she lives in a household with a score of ≥ 4. The *SMD* rate is defined as the fraction of people living in households with a score of at least four.

With respect to the *ARP* that is based on income of a given year, the *SMD* makes reference to a set of resources and functionings that are more naturally related to the concept of permanent income (Ayala et al., 2011); moreover the

threshold does not vary from year to year, and accomodates naturally for differences in the price levels of different subset of a country. Although theoretical motivation of multidimensional poverty measures are sound, operationalization is difficult: the choice of the items, their face validity, the aggregation of the indexes and the reliability of the scale can be critical. The *SMD* currently adopted in the EU and that we consider here, suffers from some limitations related to small number of items considered and the relevance of some of the items and namely the last three (see European Commission, 2012; Guio and Marlier, 2013, for a discussion of these issues).

The subjective poverty rate is based on a single question about the ability of the household to make ends meet (*Thinking of your household's total income, is your household able to make ends meet, namely, to pay for its usual necessary expenses?*). A person is classified as poor if he/she lives in a household that provides the answer *with great difficulty*, otherwise it is not. Other levels in the answer are *with difficulty, with some difficulty, fairly easily, easily, very easily* In general, this evaluation of the economic status will be influenced by both the current and the permanent income (Whelan and Maitre, 2010), but also the social capital (Guadagno et al., 2013) and social environment in which the household live (Buttler, 2013). This measure does not depend on a national or local threshold, although subjective evaluation will be influenced by social construction of *necessary expenses*.

3. The data and preliminary evidences

3.1 The EU-SILC data

We analyze data from the four successive waves of the EU-SILC survey that took place between 2010 and 2013, focusing on the Italian sample. The survey is conducted in most countries across the European Union by the relevant National Institutes of Statistics using harmonized questionnaires and survey methodologies. Although they follow common guidelines, sampling designs can differ from country to country . In Italy, the EU-SILC is a rotating panel survey with 75% overlap of samples in successive years. The fresh part of the sample is drawn according to a stratified two-stage sample design, where municipalities (LAU 2 level, partitions of the regions) are the primary sampling units (PSUs), while households are the secondary sampling units (SSUs). The PSUs are divided into strata according to their population size and the SSUs are selected by systematic sampling in each PSU.

Our analysis considers the longitudinal sample of households interviewed in all the four successive waves that took place between 2010 and 2013. We are interested in households with dependent children. A dependent child is any person aged below 18 as well as aged 18 to 24 years, living with at least one parent and economically inactive. In our analysis we consider only those households where at least one dependent child is present at least once in the four successive interviews. Using this criterion the sample we analyze is of size $N = 978$ households (each year).

Although at-risk-of poverty, subjective poverty and severe material deprivation rates are defined as proportion of people

living in a given condition of deprivation, this condition is defined at the household level, under the implicit assumption that resources are shared equally within households. We consider the household to be our statistical unit and all the variables that we consider in our study are defined at the household level.

Table 1: Proportion of households classified as at-risk-of-poverty (*ARP*), subjectively poor (*SP*) and severely materially deprived (*SMD*) in our sample ($N = 978$ each year).

Survey wave	*ARP*	*SP*	*SMD*
2010	18.1	16.6	5.4
2011	18.8	15.5	10.2
2012	18.9	16.8	12.2
2013	18.2	17.4	10.9

Table 2: Probability that a household is classified as not poor (or poor) according to the measure in column, provided it is classified in the same way according to the measure indexing the row.

	Overlap (non poor)			Overlap (poor)		
	ARP	SP	SMD	ARP	SP	SMD
ARP	100	88.6	93.9	100	44.4	31.5
SP	87.7	100	96.0	46.5	100	44.1
SMD	86.2	89.1	100	52.3	70.1	100

Source: Authors' calculations on EU-SILC wave 2013.

3.2 Stylized facts

The proportion of households in our sample classified as at-risk-of-poverty, subjectively poor and severely materially deprived are shown in table 1. These figures are not directly comparable to national estimates of poverty rates, not only as they are restricted to a subset of the households, but also because they are calculated at the household level, while published rates are defined in terms of persons.

We note that both the at-risk-of-poverty and the subjective poverty prevalence did not change much in the four years, while severe deprivation increased quite substantially between 2010 and 2011. This growth is in line to the dynamics of the population as a whole (ISTAT, 2014): among the items that defines the condition of material deprivation the possibility of facing unexpected expenses, that of affording a holiday week and difficulties in paying their rent, mortgage or utility bills are those that seems to be more sensitive to the worsening of the situation during the recent downturn. These items react to economic shocks, such as job loss or move from permanent, full-time job to part-time, precarious job in the short run and provide a possible clue for the sensitivity of this indicator to the worsening of the general economic conditions. For a general discussion of the dynamics of severe poverty rate during the recent economic downturn and its possible determinants see Kis et al. (2015). As noted by Hick (2015) the time dynamics of different poverty rates can be different, as they tend to identify different set of households as poor.

In table 2 we show how the three measures of poverty overlap in our sample. We note how this overlap is quite low, especially as the poor are concerned. Less than half of the households classified as at-risk-of-poverty are also subjective

poor, an effect that can be attributed to the effect of a single national threshold has on a country characterized by large divide and also to the role of permanent income and social capital (Buttler, 2013). The influence of permanent income on determining deprivation (and to a lesser extent subjective poverty) can explain the low overlap between severe material deprivation and the risk-of poverty and the relatively high number of deprived families that perceives themselves as under economic stress. Measurement problems, difference in perceptions and expectation (McKnight, 2013) can also be considered in explaining this poor overlap.

Table 3: Probabilities of being either not poor (NP_t) or poor (P_t) at time t given the same status in the year before ($t-1$) according to the three poverty measures considered: at-risk-of-poverty (*ARP*) rate, subjective-poverty (*SP*) rate and severe material deprivation (*SMD*).

	ARP		SP		SMD	
	$NP_t\|NP_{t-1}$	$P_t\|P_{t-1}$	$NP_t\|NP_{t-1}$	$P_t\|P_{t-1}$	$NP_t\|NP_{t-1}$	$P_t\|P_{t-1}$
2010/11	91.6	66.1	89.7	42.0	91.4	37.7
2011/12	93.3	71.7	90.9	58.6	92.5	53.0
2012/13	95.0	74.6	91.5	61.6	94.8	52.1

Table 3 describes the patterns of permanence in the poverty/non poverty status in the four years of under study. For the household with children that we consider in this paper, poverty persistence is, in general very high. For the at-risk-of-poverty the rates are clearly higher with respect to subjective poverty and severe material deprivation. These two, however see the persistence in the poverty status growing in the last two years. This high persistency can be attributed to observed

and unobserved heterogeneity, whose effect we will try to separate from that of genuine state dependence in the second part of this paper.

The variables that we consider to model observed heterogeneity can be grouped into *i*) household indicators; *ii*) economic indicators; *iii*) life events. The first group includes the household size, the number of dependent children, an indicator that separates households with a single adult from those with two or more, presence of member(s) with disability in the household, and presence of person(s) aged 65 or more (elderly) in the household. Among the economic variables we consider two related to the labour market.

First, we consider the work intensity of the household defined as the ration of the number of months that all working age household members have been working during the income reference year to the total number of months that could theoretically be worked within the household. Working age is defined as 18-59, dependent children are excluded from the computation. Secondly, we classify the status on the labour market of individuals in working age in 1) employed (high skill job), 2) employed (low skill job), 3) unemployed, 4) inactive, considering these statuses as ordered categories. Discrimination between high skill and low skill jobs are based on International Standard Classification of Occupations, ISCO-88. To obtain an household level variable we consider the highest level attained by a working age member of the household.

Other economic variables include a dichotomic variable that separates those that have to pay a rent for the house from those who owns it, an indicator for residence in an urban area, and regional dummy variables depending on the household residence. As for life events we include the change in the work

intensity defined as the variation of work intensity between two successive years. Other life events, often considered in the literature, such as the birth of a new child are not considered as they are poorly measured in the EU-SILC survey (Greulich and Dasré, 2017) and are presumably few in number given the size of our sample. Simple sample statistics for all these variables can be found in table 4.

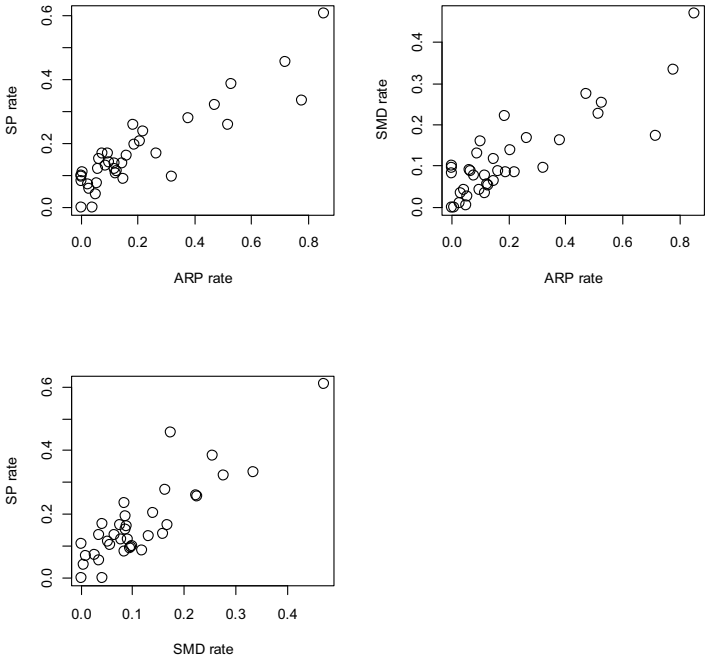
Hick (2015), comparing at-risk-of poverty and material deprivation rates notes that although the two measures show only a partial overlap at household level and have different time patterns, they are consistent in the sense that they identify the same groups as more exposed to poverty. His statement is consistent with evidence provided, at least at the exploratory level, by our data. We cross-classified the sample (pooled over the four waves) by region of residence (North West, North East, Center, South), number of dependent children in the household (0, 1, 2 or more) and work intensity level (below 0.5, between 0.5 and 0.99, exactly equal to 1) and then plotted the three poverty rates one against the other. The plots are reported in figure 1.

In all the three scatterplots of figure 1 the relationship appears to be approximately linear and strong, with a Pearson linear correlation between 0.85 and 0.9. The highest level is attained by the couple SP and SMD rates. When the at-risk-of-poverty is involved some of the points appear to deviant: these pertain to groups of families residing the South of the country, where the threshold defined as the 60% of the national median tend to identify large portions, often a majority of households as at risk of poverty. In many cases this measure of deprivation is in disagreement with the other two that are more consistent in this part of the population.

Table 4: Means and standard deviations of variables used in the models to describe household heterogeneity. Means and standard deviations are calculated on the sample *pooled* over the four waves.

Variable	Mean	St.dev
Household size	3.491	0.851
No. of dependent children	1.293	0.666
Single adult	0.160	0.366
Presence of disabled	0.278	0.448
Presence of elderly	0.061	0.240
Work intensity	0.676	0.334
Change in work intensity	-0.006	0.244
Low skilled worker	0.417	0.493
High skilled worker	0.458	0.498
Not employed	0.125	0.330
No tenure indicator	0.359	0.480
Urban area indicator	0.395	0.489
North	0.469	0.499
Centre	0.209	0.406
South	0.322	0.467

Figure 1: ARP, SP and SMD rates calculated for groups of households obtained cross-classifying the pooled sample by region of residence, number of dependent children in the household and work intensity level.



4. Econometric model

As explained in the Introduction, we consider and compare three sets of estimates for three measures of poverty, such as 'at risk of poverty', ability to make ends meet or subjective poverty, and severe material deprivation. For all measures, the econometric tool we consider is a dynamic random effects probit model with autocorrelated errors. To simplify the model description in what follows we only refer to poverty. The inclusion in the right-hand side of the lagged poverty status allows us to disentangle the contribution to poverty of unobserved heterogeneity and past poverty or state dependence, which is important to account for persistency into the risk of poverty. When estimating the degree of state dependence of a condition (e.g., poverty, material deprivation, unemployment, low-pay) it is essential to distinguish between true (or genuine) state dependence, captured by the impact of the lagged dependent variable, and spurious state dependence, caused by the presence of time-invariant unobserved heterogeneity.

Persistency may be due in part to household observed and unobserved heterogeneity (people with adverse characteristics may be exposed to a higher risk of poverty regardless of their previous state), rather than to genuine state dependence. Neglecting these factors makes the relationship between poverty at time t and poverty at time $t - 1$ spurious, since the coefficient of the lagged dependent variable implicitly also captures other drivers of poverty.

The dynamic specification is augmented incorporating an initial conditions equation by following the method proposed by Heckman (1981). This allows us to account for possible correlation between the household specific unobserved

heterogeneity term and the past poverty status and, therefore, to avoid an overestimation of the state dependence parameter and to obtain spurious state dependence. Finally, our specification allows for autocorrelated error terms, to deal with possible correlation between transitory shocks. The model is estimated using a maximum simulated likelihood estimator (for practitioners, the command *redpace* in the statistical software Stata, see Stewart, 2006, for details).

The Heckman model requires a simultaneous estimation to solve the issue of initial conditions. The main (or structural) equation is represented as a standard dynamic probit model with random effects, where the latent variable y^*_{it} of the estimated equation is specified as:

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

$$y_{it} = 1[y^*_{it} > 0] \quad (2)$$

and the dependent variable y takes value one if a household i, with $i = 1,...,N$ is in poverty status, according to one of the definitions introduced above at time t, with $t = 2,...,T$, indicating the time periods. x_{it} is the vector of control variables, that includes household and economic indicators. Among household indicators, we include the number of dependent children and household members, dummy variables for the labour market status that requires the highest skills (based on the type of occupation we distinguish between high and low skilled workers, and the baseline category includes unemployed plus inactive), the presence of elderly (individuals older than 65), disabled in the household, and for the presence of only one adult in the household (mono-parental or single-parent household). Economic indicators are the household work intensity, household home ownership (tenure status), whether the household live in a densely populated area, intermediate or scarcely populated area, and the macroarea of

residence. β is a vector of unknown parameters to be estimated. Finally, α_i is the household-specific and time-invariant random component, and u_{it} is the idiosyncratic error term. We assume that both α_i and u_{it} are normally distributed and the composite error term:

$$v_{it} = \alpha_i + u_{it} \tag{3}$$

is correlated over time due to the household-specific term α_i:

$$\lambda = corr(v_{it,}\, v_{it}) = \frac{\alpha_\alpha^2}{\alpha_\alpha^2 + \alpha_{u\alpha}^2} \tag{4}$$

Identification of non-linear dynamic models typically assumes that the set of regressors in the initial conditions equation contains one or more variables not included in the structural equation (exclusion restrictions). These are regarded as instrumental variables, which have to be associated with 'being at risk of poverty at time $t-1$', be independent of 'being at risk of poverty' conditional on observed and unobserved heterogeneity, and be independent of the unobserved factors and, hence, independent of the errors.

In his studies of labour market dynamics, Heckman (1981) suggests that initial conditions should be instrumented with information prior to labour market entry. However, the EU-SILC dataset does not contain variables that define pre-sample information, which would be desirable to explain poverty in the initial period. We consider two instrumental variables: a binary variable that identifies whether there is home ownership (tenure status), and the work intensity status of the household.

The reduced form equation approximating the conditional distribution of the initial conditions takes the following form:

$$y_{i1} = 1[z'_{i1}\pi + \xi_i > 0] \quad (5)$$

where z_{i1} is a vector of exogenous variables, including x_{i1} control variables, and the additional instrument for identification purposes. ξ_i is an error term correlated with α_i but uncorrelated with u_{it} for $t > 1$

$$\xi_i = \theta\alpha_i + u_{i1} \quad (6)$$

Testing that $\theta = 0$ provides a test for exogeneity of the initial conditions. Finally, we assume that the error term follows an auto-regressive process, such as:

$$u_{it} = \rho u_{it-1} + \epsilon_{it} \quad (7)$$

The estimated coefficients are indicative only of the direction of the impact, but not the size of previous poverty on current poverty. To understand the magnitudes of the state dependence and allow interpretation of the estimates, we also compute average partial effects (*APE*) following the method suggested by Woolridge (2005) and Stewart (2007).

5. Analysis of the results

Our econometric analysis is based on dynamic random effects probit models with autocorrelated errors estimated separately by poverty measure on balanced samples of households with dependent children (see Section 3.1 for details). We estimated simple dynamic random effects probit models, but we found evidence of autocorrelated errors for all the specifications. Although the estimated coefficients and *APE* were similar to our benchmark model, the state dependence parameters were overestimated (for the sake of brevity, we do not report these

results, but they are available upon request). We therefore decided to adopt a specification that allows for autocorrelated errors.

The triplet composed *ARP*, *SP* and *SMD* rates offer measures of poverty from different angles and, to the purposes of this paper, it offers the opportunity to compare whether structural characteristics of the households (household indicators), variables related to the labour market and life events (economic indicators), let alone the actual state dependence, act similarly or not on poverty measured in the three different ways.

Tables 5 and 6 show the estimates for the initial conditions and structural equations, respectively. To understand the magnitudes/sizes of state dependence and of the effects of household and economic indicators, we also calculate *APE* (see Section 4).

First, we discuss the impact of the household and economic indicators in the initial conditions equation (Table 5). In the initial period, we find that the number of dependent children increases the risk of *ARP* by 1.5 percentage points (pp) while it does not significantly affect *SP* and *SMD*. A possible explanation for the number of dependent children being significant for ARP that makes reference to the modified OECD equivalence scale and not for the other two, and especially for the SP, may be that this equivalence scale possibly underestimates the economies of scales in households with children (Bishop et al., 2014). Interestingly, the presence of elderly significantly reduces the probability of being poor regardless of the adopted definition of poverty. This might be due to the fact that elderly provide a source of income, such as private pensions, which represent a secure and valuable source against the risks of poverty and severe material deprivation.

The literature on poverty dynamics already in the past has pointed out the role of secondary earners (for instance grandparents) in lifting up poor households above the low-income cut-off (OECD, 1998; Jenkins, 2000). We thus provide further empirical support for this argument, by showing its relevance in Italy also beyond the low-income context (severe material deprivation).

The detriment of single parent households compared to households with dependent children, as expected, clearly arises in the initial period estimates (Table 5).

Given that we analyse households (sample units) and poverty and material deprivation at the household level, we include among economic indicators a measure that summarizes the labour market involvement of the household, that is the household work intensity. The work intensity of a household (as explained in Section 3.2) is the ration of the total number of months that all working-age household members have worked during the income reference year (worked months) to the total number of months the same household members theoretically could have worked in the same period (workable months).

For economic indicators, we find that work intensity significantly reduces the probabilities to fall into poverty (*ARP* and *SP*) and severe material deprivation. Interestingly, in a previous attempt, we also add an indicator for the number of employed in the household and we find that it is household work intensity, and not the number of employed in the household, fundamental to prevent the household to fall into poverty (*ARP* and *SP*) and severe material deprivation. This finding for Italy is confirmed by Eurostat (also) at the EU level (Eurostat, 2018). Having a job is not always enough to avoid poverty: in 2016, for instance, 7.8% of the working EU

population were at risk of poverty even if they were working/employed. The spread of precarious contracts, low-paid jobs and underemployment implies that the labour market has stopped being a stable source of prosperity for many people and their families (Eurofound, 2010).

Work intensity is one of our instrumental variables. The other, home ownership (measured by a dummy for no tenure), is also significant to prevent household subjective poverty and severe material deprivation. The sign and significance of our instruments reassure on model identification issues.

The geographical divide (South with respect to Centre-North of Italy) of the risk of poverty and severe material deprivation is confirmed in this set of estimates. Finally, we report thetas and rhos parameters to account for/testing errors autocorrelation and exogeneity of initial conditions.

In the structural equation (Table 6), a strong state dependence emerges, regardless of the considered poverty measures thus providing evidence of poverty persistence or poverty trap. This is in line with the existing literature on poverty persistence in Italy (Addabbo et al., 2015; Giarda and Moroni, 2018) and adds up evidence for *SMD*. The estimates of the APE of the lagged dependent variables show the existence of true (or genuine) state dependence in all the statuses analysed. The *APE* are positive and statistically significant, and the magnitude is higher for poverty (both *ARP* and *SP*) compared to severe material deprivation (*SMD*). We note that, in Italy, being poor at $t - 1$ increases the poverty risk and subjective poverty (poverty perception) in the next period by 52.1 and 50.8 pp, respectively. *SMD* in the previous period increases the SMD risk by 24.3 pp.

For household indicators, we observe that the number of dependent children is positively associated to both poverty

measures (+9.4 pp risk of *ARP*, and +4.6 pp risk of *SP*), while it does not play a relevant role on *SMD*.

The presence of disabled, as well as single-parent (mono-parental) household increase the risks of poverty and *SMD*.

For the presence of disabled we can distinguish between twofold effects (both negative) on household poverty. On the one hand, a direct effect of the presence of disabled in the household on poverty. Parodi and Sciulli (2011), for example, analyse the economic effect of disabled members on Italian households and find that the risk of poverty is higher for households with disabled members compared to those without disabled. On the other hand, there is an indirect impact of the presence of disabled, such as the effect of caring activities on other household members labour market participation and employment. Marenzi and Pagani (2005), as well as the more recent work by Bratti and Staffolani (2012), find a negative effect of the presence of disabled in the household on the economic participation of the other not disabled components.

Single-parent households suffer of higher poverty and material deprivation compared to household with dependent children. In general, single-parent households are characterized by much higher poverty incidence rates (OECD, 2014). Additionally, this household type may have more constraints in reconciling work and family responsibilities than a couple with dependent children, which may contribute to decreasing their bargaining capacity in the labour market and the competition for better paid/quality job (Kahn, 2012; Nieuwenhuis and Maldonado, 2018).

For economic indicators, we find a negative association between poverty and material deprivation and the presence of low, and especially high skilled worker in the household (-11.2 pp and -11.6 pp for high and low skilled worker,

respectively, for *ARP*, -5.4 and -15.5 pp for *SP*, and -13.3 and 21.9 pp for *SMD*). This confirms the relevant relationship between labour market participation and poverty.(e.g., Coppola and Di Laurea, 2016). Additionally, we note that the change in work intensity significantly help reducing poverty (by -28.7 pp *ARP*).

Lastly, while we do not find a clear role for the degree of urbanization, the geographical differentials in poverty and material deprivation risks and rates clearly emerge. Our results suggest that the diffusion of poverty and severe material deprivation in the South of Italy is larger than in the Centre-North even after controlling for all other variables. Living in the North reduce the *ARP* and *SP* by -14.4 pp and -18 pp, and by -20.1 pp *SMD* with respect to residing in the South. This is due to the fact that Italy is structurally afflicted by territorial differentials in the levels of economic development (measured by the GDP), in labour market indicators (notoriously the unemployment rate), as well as in infrastructure provisions (Iuzzolino et al., 2011; Vecchi, 2011; Giarda and Moroni, 2018).

To sum up, a strong true state dependence emerges, regardless of the considered poverty measures thus providing evidence of poverty persistence or poverty trap in Italy.

One of the most important finding that household work intensity is fundamental to prevent the household to fall into poverty and severe material deprivation. We also find that is the level of skills required by the job, such as being low or high skilled workers, that makes the difference. The number of employed *per se* is no more enough to prevent poverty. In-work poverty is a widespread problem in Italy.

Table 5: Random effects dynamic probit: results for initial conditions equations.

	ARP		SP		SMD	
	Coef.	**APE**	**Coef.**	**APE**	**Coef.**	**APE**
Household indicators						
# dependent children	0.366***	0.015	0.111	0.057	-0.019	0.012
	(0.135)		(0.111)		(0.156)	
Household size	-0.071	-0.008	0.144	0.056	0.328*	0.109
	(0.109)		(0.093)		(0.130)	
Presence elderly	-0.748*	-0.034	-0471*	-0.186	-0.440**	-0.170
	(0.328)		(0.261)		(0.405)	
Single adult	0.739***	0.094	0.512***	0.183	0.721***	0.229
	(0.212)		(0.169)		(0.254)	
Economic indicators						
Work intensity	-2.514***	-0.451	-0.928***	-0.320	-1.539***	-0.369
	(0.280)		(0.161)		(0.268)	
No home ownership	0.193	0.016	0.577***	0.214	0.661***	0.231
	(0.128)		(0.106)		(0.172)	
Urban area	0.012	0,001	0.116	0.044	0.171	0.062
	(0.128)		(0.106)		(0.170)	
North	-0.672***	-0.054	-0.275*	-0.106	-0.503***	-0.185
	(0.154)		(0.122)		(0.187)	
Centre	-0.500***	-0.031	0.002	0.001	-0.816***	-0.313
	(0.176)		(0.140)		(0.280)	
Constant	0.389		-1.316***		-2.246***	
	(0.378)		(0.325)		(0.498)	
Theta	1.985		0.631*		0.398***	
	(1.401)		(0.362)		(0.136)	
Rho (AR1)	-0.338***		-0.447***		-0.218*	
	(0.046)		(0.042)		(0.086)	
Observations	3,912		3,912		3,912	

Notes

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Standard errors in parentheses.

Source: Authors' calculations from EU-SILC 2010-2013 data.

The combination of employment growth and increasing in-work poverty suggests that having a job, i.e. being employed, is no longer enough to ensure a decent standard of living.

Table 6: Random effects dynamic probit: results for structural equations.

	ARP		SP		SMD	
	Coef.	**APE**	**Coef.**	**APE**	**Coef.**	**APE**
Lagged dependent variable	2.269*** (0.108)	0.521	1.674*** (0.172)	0.508	0.854*** (0.234)	0.243
Household indicators						
# dependent children	0.307*** (0.055)	0.094	0.143*** (0.051)	0.046	0.032 (0.072)	0.007
Presence disabled	0.153* (0.075)	0.048	0.349*** (0.070)	0.116	0.308*** (0.099)	0.072
Single adult	0.326*** (0.090)	0.102	0.234*** (0.089)	0.078	0.326* (0.139)	0.079
Economic indicators						
Low skilled worker	-0.364*** (0.107)	-0.112	-0.167* (0.096)	-0.054	-0.607*** (0.140)	-0.133
High skilled worker	-0.375*** (0.109)	-0.116	-0.466*** (0.113)	-0.155	-0.984*** (0.165)	-0.219
Change in work intensity	-1.070*** (0.140)	-0.287	-0.162 (0.133)	-0.049	0.188 (0.164)	0.033
Urban area	-0.011 (0.070)	-0.004	0.064 (0.066)	0.021	-0.047 (0.107)	-0.011
North	-0.454*** (0.086)	-0.144	-0.537*** (0.102)	-0.180	-0.890*** (0.158)	-0.201
Centre	-0.296*** (0.095)	-0.091	-0.409*** (0.101)	-0.131	-0.657*** (0.162)	-0.130
Log likelihood	-1121.87		-1363.05		-938.59	
Wald test (df 10)	201.23		870.37		561.21	
Observations	3,912		3,912		3,912	

6. Conclusions

In this research, analyzing a four year panel sample, we focused on poverty experienced by households with dependent children in Italy. We wanted to identify structural characteristics and economic conditions that represent *risk factors* for poverty and to assess the degree of poverty persistence, i.e. how it is likely that an household fallen into poverty remains trapped in this condition. As poverty is a multi-dimensional complex phenomenon, and no single measure can be satisfactory, we decided to reproduce the same econometric analysis using three different popular poverty measures: at risk-of-poverty, subjective poverty and severe material deprivation rate.

A first conclusion that we can draw is that poverty persistence is high, and this state dependence remains even after controlling for the *risk factor* variables. Quite interestingly, we found that the degree of poverty persistence is lower for severe material deprivation, despite this measure is known to depend more on permanent income with respect to the risk of poverty or subjective poverty that depend to a greater extent on temporary income. Possible explanations include on the one side the way material deprivation is measured in the EU-SILC framework, the position in the life cycle the relatively young families with dependent children occupy; on the other, the persistence of low income for households at the lower levels of society, given the feature of the Italian labour market.

As a second conclusion we highlight how work intensity appears to be a more effective measure with respect to the traditional dichotomous employed / unemployed condition to measure how the position on the labour market of household

members impact on household poverty status. To consider work intensity, that is defined at the household and not at the individual level has also interesting policy implications.

Other interesting facts emerge from our analysis: the risk of falling into poverty increase with the number of children, confirming that the system of social transfers offer poor aid to households with children in Italy, especially if parents have precarious, temporary jobs; the North-South divide is important not only to stratify the probability of being poor at the beginning of the period, but acts also in the structural equations, implying that the poverty trap is more difficult to escape for households residing in the South. Eventually, we found that the presence of elderly in the households reduce the poverty risk: pension income have been relatively stable in Italy during the economic downturn and family networks are still an important tool to help the Italian families to stay out of poverty.

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