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# Government effectiveness, middle class and poverty in the EU: A dynamic multilevel analysis

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# Government effectiveness, middle class and poverty in the EU. A dynamic multilevel analysis.

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*Abstract*

Using the 2008-2011 EU-Statistics on Income and Living Conditions data, we implement a dynamic three-level model to analyze poverty persistence in 26 EU countries. Our aim is to understand why an individual experiencing poverty today is much more likely to experience it again. We innovate with respect to the existing literature by disentangling the effects of observed and unobserved heterogeneity at country level on the process that may generate poverty persistence. In particular, after controlling for socio-economic factors, including those related to qualitative and quantitative indicators of the welfare state, we analyze for the first time how the size of the middle class in each country affects current individual risk of poverty and its dynamics. Our findings show that the risk of poverty is negatively related to the quality of government activity to social expenditure and to the size of the middle class. Similarly, we show that the impact of past records on current poverty levels may be stronger (weaker) when institutional quality is low (high). This also indicates that good institutions and satisfactory social expenditure may help reducing the adverse current and future impact of experiencing poverty for any level of per capita income and middle class size. Policy implications are also discussed.

**Key words**: poverty, multilevel model, dynamics, government effectiveness, middle class
**JEL-codes** C23 · C25 · I30

## 1. Introduction

The 2008 economic crisis and the protracted period of instability and stagnation that almost immediately followed the outbreak of the crisis came with an increase in poverty across the EU (Duiella and Turrini, 2014; Stockhammer, 2015). In particular, in the member states most severely hit by the crisis, the prospects for the most vulnerable parts of the population became a serious source of concern. In the 2010, the EU member states endorsed a new EU strategy (called Europe 2020) designed to promote, among other objectives, "social inclusion in particular through the reduction of poverty" by aiming to lift at least 20 million people out of the risk of extreme poverty and social exclusion. Logically, the fulfillment of the above ambitious 20-million-people program requires a thoughtful analysis of how future income growth, educational levels, technical development and any other economic improvements as well as political accountability and institutional quality can generate social inclusion and poverty risk reduction or persistence. Yet, the causes behind the dynamic process that leads an individual to be poor are both *macro* and *micro* and the persistence of poverty may arise from individual heterogeneity as well as countries' economic and political factors. Hence, if individuals experience poverty in a specific time because of adverse idiosyncratic personal characteristics, they will be likely to experience poverty in other subsequent periods. This may happen notwithstanding the improvements in the country's general economic conditions from one period to the next. These adverse characteristics can be either observable or unobservable. Empirical literature has widely inquired the impact on poverty of individual observable characteristics (i.e. sex, level of education, household status, occupation status) as well as the relationship between country-level characteristics (i.e. per capita income, different qualitative and quantitative measures of the welfare state effort and country specific effects). What is not thoroughly investigated in a properly defined dynamic longitudinal framework, however, is precisely the relationship between poverty dynamics and unobservable country factors. Still, a proper understanding of the above relationship can be a useful support to any anti-poverty program in the EU as elsewhere. The lack of that specific knowledge may adversely affect policy decisions.

The aim of this paper is twofold. We want to estimate the probability of poverty persistency in the EU when observable and unobservable heterogeneity at the country level are correctly disentangled and the dynamic process that leads an individual to be poor has been defined in order to isolate true state dependence phenomena. We feel that distinguishing between the two processes (true state persistence and heterogeneity) is crucial since the policy implications of the two are very different. If persistence of poverty is (at least partly) due to a true state dependence, then it makes sense to plan measures aiming *at pulling the individual out of poverty* at time $t$ in order to reduce her chance of experiencing poverty at time $t$+1. Thus, it would be logical to implement measures that intervene on factors that (at least partly) generated the true state dependence in order to break the "vicious circle". On the contrary, if the persistence of poverty is mainly due to unobserved heterogeneity, any short-term policy aimed to pull the individual out of poverty at time $t$ would not be effective at time $t$+1. To disentangle the effects of country-level explanatory variables and to isolate state dependence, the paper implements a three level dynamic multilevel model. Building on the technique proposed by Wooldridge (2005) – that estimates consistently a two level model with both lagged dependent and exogenous variables to distinguish between true state dependence and heterogeneity at the individual level – we propose a method that adds a further level of analysis in order to investigate the impact of heterogeneity at country level on the

individual risk of poverty. This three-level approach permits to disentangle the effects of country-level explanatory variables and to appreciate the effects of country dummies by specifying country membership as a random effect
Second, we want to expand the hypotheses about observed heterogeneity and include for the first time both the quality of public institutions and the size of the middle class in each country under the assumption that they jointly affect, among other factors, individual poverty dynamics. Differences in the implementation of the EU anti-poverty strategy may emerge as the consequence of inevitable dissimilarities of the national welfare systems – resulting from distinct national political orientations, ethical values, and social norms – and as the effects of differences in the organization and operation of each public administration. Therefore, differences in the quality of the public institutions in each country should be treated as a source of cross-country heterogeneity. The size of the middle class is included in our study for analogous reasons. For many, middle class is instrumentally important to economic development. A large middle class is supposed to foster entrepreneurship, shift the composition of consumer demand and make it possible to implement those political and institutional reforms conducive to growth and, ultimately, to poverty reduction. We want to test the likelihoodness of these hypotheses about the countries' sources of observable heterogeneity and offer fresh empirical evidence on the determinants of poverty in the EU during a period characterized by a deep economic crisis.

Then, the paper analyses the persistence of poverty in Europe by testing new hypotheses about the countries' sources of observable heterogeneity (the quality of institutions and the size of the middle class) and by proposing a new multilevel estimation technique. Results show that that there is substantial correlation between the initial poverty condition and the unobserved heterogeneity. Individuals experiencing poverty at a certain point in time have a higher probability to experience poverty in the future than non-poor individuals do (i.e., we find evidence of true state dependence). Moreover, the estimate of the true state dependence in countries characterized by low social expenditure, low government effectiveness and limited middle class is much higher than the one observed in countries characterized by high social expenditure, high government effectiveness and extended middle class. Thus, estimates allow inferring that good institutions combined with high social expenditure may help reducing the adverse impact of experiencing poverty in a specific period.
The rest of the paper proceeds as follows. In Section 2, the literature on poverty dynamics is shortly reviewed. Section 3 contains our discussion of the hypotheses about the role of the middle class and the quality of institutions. In Section 4, we present the data set employed in the estimation strategy. Section 5 contains a presentation and discussion of the estimation results and test. Section 6 concludes.

## 2. Longitudinal studies of poverty

### 2.1 Longitudinal approach and micro-drivers of poverty

Longitudinal research have covered two main themes: the duration of poverty spells (and its persistence) and the determinants of poverty states (i.e. individuals' attributes and life events; macro factors).

Studies on poverty duration aim at understanding whether poverty is a transitory status which individuals are exposed to in some phases of their life (i.e. temporary poverty) or it is a condition lasting for longer periods (i.e. persistent poverty). Empirical studies have revealed high levels of mobility into and out of poverty. Pioneers in this kind of analysis were Bane and Ellwood (1986) and Stevens (1994).

The former proposed the so-called individuals' spells approach aimed to study mobility into and out of poverty and to identify characteristics and trigger events of poverty exit and re-entry in US during the period 1970-1982. Stevens (1994) extended this approach by allowing for multiple or repeated spells and applies it to 1970-1987 US data. The analysis has, then, been extended to many other countries[1]. Most of the findings suggest that the majority of the experiences with poverty are short-lived, whereas a minority of the poor are below the threshold for long period. However, empirical evidence shows that the probability of exit from poverty depends on the state duration: the longer is the period spent in poverty, the lower is the probability that the transition out of poverty occurs. Most studies find that poverty duration dependence remains significant even when controlling for observed/unobserved heterogeneity. For example, Canto (1996) examines the duration dependence for poverty entries and exits in Spain using a nonparametric specification for the hazard rate. She controls for unobserved heterogeneity indirectly by testing the homogeneity of the hazard rate between groups that are likely to have different spell lengths. She finds significant duration dependence both for poverty reentries and exits. Cappellari and Jenkins (2004) using data from the BHPS for the 1990s conclude that there is substantial state dependence in poverty, separately from the persistence caused by heterogeneity. Biewen (2006) reports that even after controlling for observed and unobserved individual characteristics, there is negative state dependence in poverty exit and reentry behavior. Andriopoulou and Tsakloglou (2011) found that the probability of exiting poverty is inversely related to the duration of the poverty spell even after taking into account socioeconomic characteristics, demographic events, and unobserved heterogeneity across individuals. Thus, poverty is simultaneously *fluid* and characterized by long-term traps (Oxley *et al.,* 2000; OECD, 2001).

Analyses of long-term poverty traps, focusing on establishing whether observed persistence is due to underlying differences in individual attributes or due to true casual effects of past on future poverty, are also performed using dynamic discrete choice models. These models permit, in facts, to solve the initial conditions problem and to account for observed and unobserved heterogeneity to distinguish true state dependence (that is, experiencing poverty in a specific period, in itself, increases the probability of undergoing poverty in subsequent periods) from spurious state dependence (Heckman, 1981; Wooldridge, 2005). Using this approach, Poggi (2007) studies social exclusion dynamics in Spain and finds that both individual heterogeneity and true state dependence are related to the probability of experiencing social exclusion. Focusing on youth poverty in Spain, Ayllon (2015) also finds that there is a substantial proportion of true state dependence in the poverty status. Devicienti and Poggi (2011) who apply a bivariate probit technique to model the dynamics of social exclusion jointly with poverty in Italy, find evidence of true state dependence and cross effects. The present study can be included in the group of longitudinal studies of poverty using this approach (dynamic discrete choice models).

As it was stressed above, the analysis of poverty dynamics analyzes the main determinants of transitions in and out from poverty. Transitions could be linked to individuals' attributes or to specific events changing individuals' needs or resources. We can refers to these factors and events as micro-drivers of poverty. According to Bane and Elwood (1986), the literature uses to distinguish demographic and

[1] Among the others, see Ducan et al. (1993), Canto (1996), Jenkins(2000), Oxley et al.(2000), Jenkins and Rigg (2001), Devicienti (2002), Hansen and Wahlber (2004), Fouarge and Layte (2005), Biewen (2006), Valletta (2006), Aranz and Canto (2012), Andriopoulou and Tsakloglou (2011) and Demir Seker and Dayioglu (2014).

economic events. The former regard changes of family composition (e.g. births, deaths, marriage, divorce), the latter concerns factors leading to changes of family income (e.g. changes of occupational statuses, increases or decreases of workloads or welfare benefits). Some authors suggests that poverty transitions is much more related to economic events than to demographic ones and a major role is played by circumstances on the labor market (e.g. Gottschalk, 1982; Polin and Raitano, 2012). Dynamic discrete choice models also investigates individual heterogeneity as determinant of poverty states. In particular, these models control for both observed (i.e. household size, age, gender, education, marital status, occupational status, area of residence) and unobserved individual characteristics (e.g. Poggi, 2007; Ayllon, 2015; Devicienti and Poggi, 2011). Empirical evidence shows that both unobserved and observed heterogeneity matters in determine poverty. Finally, one can be also use decomposition methods to inquire individual heterogeneity as driver of poverty. In facts, decomposition methods permit to evaluate the impact of socio-demographic and labour market country specific characteristics of poverty. For example, Dickens and Ellowood (2001) provide a strategy for decomposing the factors influencing poverty in Britain and the United States and find that demographic and wage change is a dominant force in both nations. Demir Seker and Jenkins, (2015) propose a decomposition method to examine the factors accounting for changes in absolute poverty rates over the two sub-periods. D'ambrosio et al. (2011) introduce a decomposition procedure to determine the exact marginal impact of a set of explanatory variables (i.e. household size, age, gender, marital status and occupational status) on poverty using Belgium, France, Germany, Italy and Spain.

Reference to individual level is therefore essential to enable us to simultaneously control for the effects of individual-level variables, contextual variables and cross-level influence on individual-level poverty. Yet, the risk in overemphasizing the individual level is to present the entire data generation process (poverty levels and dynamics) as the result of the individual characteristics of poor people and to predetermine an explanation of poverty as result of the behavior and attributes of the poor. Partly in response to the necessity to prevent this danger, this paper will make an effort to contextualize stratification within the institutional framework and the socio-economic relations that generate poverty.

### 2.2 Macro drivers of poverty

Among the macro factors affecting poverty, the negative relationship between different qualitative and quantitative measures of *welfare state and income poverty* is a well-established result (e.g. Goodin et al. 1999; Kenworthy 1999; Van den Bosch and Cantillon 2006; Layte et al., 2001; Muffles and Fouarge, 2004). Empirical evidence confirming such relationship is, in facts, offered by many cross-sectional studies and some longitudinal studies that use the individuals' spells approach[2]. For example, Fouarge and Layte (2005) explore how different country welfare regimes (corporatist, social democratic and liberal) impact on the distribution of poverty and its duration in Europe for the period 1994-1998. Dewilde (2008) evaluate to what extent between-country differences in the probability of being 'multidimensional' poor can be explained by a range of 'domain-specific' indicators of welfare regime arrangements (e.g. replacement rate in case of unemployment, social assistance benefits, labor market flexibility, and support for families). After controlling for the nesting of individuals within households and countries by using robust standard

[2] Statistics of our macro drivers are reported in Table 1 and Fig. 1 shows a Scatter Matrix of macro determinants and the poverty dependent variable (a substitute for the variance-covariance matrix.

errors, she concludes that institutional arrangements do influence the risk of multidimensional poverty in the expected direction. Other authors have focused on the transfer system, since it is an important component of the welfare regime. They find a significant relationship between social policy generosity and poverty (e.g., Jenkins, 2000, Whelan et al., 2008; Kenworthyet al., 2011, Dueilla and Turrini, 2014). Since both welfare state generosity and the level of poverty are at least partly determined by the general level of economic welfare in a society, the impact of institutions is often estimated controlling for affluence, measured in terms of GDP per capita (Dewilde, 2008). Cross-sectional empirical evidence seems to indicate that the association between GDP and poverty is expected to be small (Whelan and Maître, 2012) or inexistent (Kenworthy et al., 2011). However, longitudinal evidence show that economic growth seems to play an important role in determining poverty states (Demir Seker and Jenkins, 2015; Bosco, 2016).

Whereas researches on the effects of welfare state measures on poverty abounds, longitudinal studies based on dynamic discrete choice models have only rarely analyzed the impact of the *institutional context* on poverty. Many dynamic discrete choice models (e.g., Devicienti and Poggi, 2011; Poggi, 2007) includes only sets of year and regional dummies to capture respectively the macroeconomic environment and structural differences in local conditions (e.g. structural differences in welfare state). These models normally do not include specific country level variables in order to keep the specification as simple as possible. Among the exceptions, Poggi and Florio (2010) analyze the impact of country specific energy reforms on deprivation and find evidence that the national energy market structure is correlated with the probability of households experiencing deprivation. The result holds even after controlling for the nesting of households within countries by using robust standard errors.

Another driver for poverty reduction/persistence is the size of the middle class. Although middle class might be considered as instrumentally important to economic development, so far the size of the middle class has not been included in longitudinal studies of poverty. A large middle class is supposed to foster entrepreneurship, shift the composition of consumer demand and make it possible to implement those political and institutional reforms conducive to growth[3]. In fact, following Aristotle's observation that the middle class benefits from good government, many economists maintain that the middle class demands good government and helps sustain it by financing public goods through willing payment of taxes (Birdsall, 2010; Alesina, Cozzi, and Mantovan, 2012; Loayaza et al., 2012). Barro (1999) has shown that countries are more likely to be democratic the higher the share of income going to middle-class families. In particular, the middle class wants a government that maintains a level playing field in the economic arena, free of insider rents and privileges, capable of regulating effectively natural monopolies, and able to administer and enforce tax systems adequate to provide security, basic infrastructure, and other public and collective goods and services (Birdsall, 2010). A large middle class can also reduce the negative impact of credit market failures on development and then on poverty. Thus, to the middle class is generally attributed "not only a moderating role vis-à-vis political extremists, but also an interest in political democratization, in good and transparent governance, and respect of civil rights" (Birdsall, 2015). As a result, poverty should ultimately decrease as middle class increases because not only more middle class implies higher growth but also because

[3] See Ravallion (2009) and the literature quoted in his paper.

meeting the demands of the middle class – or, conversely, attending to their need for security – is crucial for the success of welfare policies[4].

In a study on poverty, the measurement of middle class however is a critical issue and, as we will see in details in Section 4, this issue is not entirely settled. Therefore, any measure of middle class results in some way arbitrary and open to criticisms. In developed countries, economists normally define as middle class the individuals having an income within some interval that includes the median and it is often symmetric (e.g. between 75 and 150 percent of median income) around the median value. That interval obviously excludes the poverty line, which is generally set at 60% of the national median equivalized disposable income. As a result, the condition of being middle class is independent upon the income level defining poverty. Still, middle class living standards begin when poverty ends and therefore the view that the ratio between those who are poor and those who are middle class should be independent upon the value of the poverty line in use in each country is open to questionings. Changes in the size of middle class, therefore, could be related to changes in the headcount of the poor from one period to the next. Define income distributions $F_{t+i}(y)$ over a range of poverty lines (where $t$ is time and $i \in [0, T]$). Then, the adoption of Atkinsons' view (Atkinson, 1987) on the measurement of poverty implies that when comparing $F_{t+i}(y)$ with $F_{t+i+1}(y)$, Atkinson's first-order stochastic dominance (FSD) conditions for a headcount poverty reduction (Atkinson, 1987, 751) requires $[F_{t+i+1}(y) - F_{t+i}(y)] \leqq 0$ with at least some $y$ for which a strong inequality holds. If all individuals in the society have an increasing utility function defined over income – U(y) with U'(y) > 0 – it follows that, under the above FSD, $E_{Ft+i+1}U(y) \geq E_{Ft+i}U(y)$, where E is expected value (necessary condition for FSD). The average utility of a risk neutral society increases when $[F_{t+i+1}(y) - F_{t+i}(y)] \leqq 0$ holds and the headcount poverty ratio decreases because $\text{Min}(y)_{Ft+i+1} \leqq \text{Min}(y)_{Ft+I}$ (necessary condition for FSD). Still, a value judgment is difficult to formulate and the fact that from year t to year t+i a left tail reduction is observed (the headcount poverty ratio reduces and the middle class headcount increases) simply implies that the society is maximizing the expected value of utility from income. Ravallion (2009, 445) discusses, as a possible case, the shift from an initial cumulative distribution function (CDF) of income at time t (A) to two possible final distributions, B and C, both with the FSD property with respect to A. The change from A to B illustrates the hypothesis that all incomes increase by a same proportion and the change from A to C the hypothesis that gains are larger at lower poverty lines. Both satisfy FSD conditions with respect to A (a poverty reduction is shown by the left tail condition) but distribution C has a "larger middle income bulge" than B. This implies that the density is appreciably higher in a wide interval around the median and that distribution C has more people vulnerable to an aggregate economic contraction that B. Poverty reduction seems more exposed to reversibility in the case of distribution C and the gains attributable to an increase in the middle class are more transitory than permanent. Therefore when studying the impact of middle class expansion on poverty reduction the issue of the evolution of poverty over time is important. Transition from Ravallion's distribution A to distribution B or to distribution C may depend upon structural (as opposed to spurious) state dependence and this requires an analysis of the relevance of state dependence on the probability to experience poverty, conditional upon the poverty status in the previous period. The contribution that the middle class can give to

[4] The beneficial involvement of the middle class comes in the form of crucial electoral support for welfare policies, as well as the taxes and social welfare contributions they made to the system they thereby support (Goodin and Le-Grand, 1987; Korpi and Palme, 1999; Dallinger, 2013).

poverty reduction can be strong, stable (as held by the literature quoted at the beginning of this section) or reversible according to how middle class affects the dynamic of past poverty. If the estimates of the state dependence of poverty in countries characterized by large middle class is high, this implies that middle class can reduce the state dependence and have a significant impact on the dynamics of future poverty. We will follow this line of research in the rest of the paper[5].

### 2.3 Combining macro and micro approaches

Recent cross-sectional studies propose to use multilevel methods for assessing to what extent differences in the characteristics of individuals and country-specific factors can explain country differences with respect to individual outcomes. These methods are attractive because they offer a means of quantifying the extent to which differences in outcomes reflect differences in the effects of country-specific features (e.g. socio-economic institutions), which are distinct from differences in outcomes associated with variations in the attributes of the individuals themselves (Bryan and Jenkins, 2015). Using this kind of models, Whelan and Maître (2012) find that the inclusion of country-level variables does not contribute much to the explanation of country differences in basic deprivation. Instead, Bárcena-Martín et al. (2014) show that country-specific factors seem to be much more relevant than individual effects in explaining country differences in material deprivation. Whelan and Maître (2013) also find a significant statistical interaction between deprivation and country attributes. However, as far as we know, dynamic multilevel models have never been used to analysis poverty in a multi-level framework. This is exactly the aim of this paper.

## 3. The model

We use a dynamic three level discrete choice model to analyze poverty. Starting from the technique proposed by Wooldridge(2005), who consistently estimates a two level model with both lagged dependent and exogenous variables to distinguish between true state dependence and heterogeneity at individual level, we extend the model adding a further level of analysis in order to investigates the impact of heterogeneity at country level on the individual risk of poverty. The result is a three level model with random intercepts. Below there is a systematic illustration of the model.

### 3.1 Two level random intercepts model

Balanced panel data can be thought of as clustered or two-level data with "occasions" (e.g. countries) at level 1 and units (e.g. individuals) at level 2. When units are clustered, multilevel models are the most appropriate approach since they permit to fully exploit the richness of hierarchical data structures (Skrondal and Rabe-Hesketh, 2004; Snijders and Bosker, 1999; Goldstein, 1995; Hox, 1995).
Wooldridge (2005) present a dynamic panel data logit model that can be seen as a two level model with random effects in the form of random intercepts. Below we briefly summarize the model presented in Wooldridge (2005). For individual *i* observed from time *t* = 1 to (as in our case) t = 4, the conditional probability that an event (poverty) occurs is

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

[5] Our measurement of the middle class headcount is in section 4.

where $\Phi$ is the logistic distribution, the dependent variable $y_{it}$ is the poverty state of individual $i$ at time $t$, $\gamma$ and ρ are the parameters to be estimated, $z_i$ and $z_{it}$ are, respectively, vectors of time-constant and time-varying explanatory variables, and $c_i$ is the individual specific effect (modeled as random intercept).
Quoting Woolddridge (2005, 41) himself, the assumptions implied by this equation are the following: "First, the dynamics are first order, once $z_{it}$ and $c_i$ are also conditioned on; second, the unobserved effect is additive inside the distribution function, $\Phi$; third, $z_{it}$ satisfies a strict exogeneity assumption.". As suggested by Wooldridge (2005), the parameters in equation (1) can be consistently estimated by assuming a density for the individual specific effect given the poverty initial condition, $y_{i0}$, and the time-constant explanatory variables, $z_i$. Thus, Wooldridge offers a solution to the initial condition problem. The latter may arises when the start of the observation period does not coincide with the start of the stochastic process generating individual poverty experiences (i.e. Arulampalam et al, 2000; Heckman, 1981). In other words, individuals could experience poverty before the period under study and, therefore, individuals excluded at the start of the observation period may be there because of an earlier history of poverty or because of some characteristics affecting their poverty propensity. But, "finding the individual specific effect distribution conditional on the initial value (and the observed history of strictly exogenous explanatory variables)" permits to account for the correlation between the individual specific effects (that are all unobserved individual determinants of poverty and are time-invariant) and the levels of poverty experienced by the individuals in the initial period (Wooldridge, 2005). Moreover, it is also possible to allow for the correlation between unobserved and observed individual characteristics. For example, if ability is an unobserved factor, lack of ability may be the cause of the current level of poverty, but it may also be correlated with the level of poverty experienced by the individual at the initial period and the level of education achieved by the same individual. Therefore, we assume that

(2) $$c_i \mid y_{i0}, z_i \sim Normal(\alpha_0 + \alpha_1 y_{i0} + z_i \alpha_2, \sigma_a^2)$$

where $\alpha_0$, $\alpha_1$ and $\alpha_2$ are parameters to be estimated and $\sigma_a^2$ is the conditional standard deviation of the individual specific effect, $c_i$. Note that the vector $z_i$ appears in (2), and not on the right hand side of (1), because otherwise we could not identify the coefficients for the time constant covariates. Given (1) and (2), we can write the conditional density for the conditional distribution and maximize the density obtained integrating the above equation with respect to the normal distribution in equation (2) in order to estimate the parameters $\gamma$, ρ, $\alpha_0$, $\alpha_1$, $\alpha_2$, $\sigma_a^2$. The estimation is consistent only under the hypothesis that the model is correctly specified.
The latent variable version of the model described in (1) and (2) is the following

(3) $$y_{it}^* = z_{it}\gamma + \rho y_{it-1} + \alpha_0 + \alpha_1 y_{i0} + z_i \alpha_2 + a_i + u_{it}$$

where $u_{it}$ is a zero mean and constant variance error term. In the model, the value of $\rho$ determines whether the poverty sequence $\{y_{it}\}$ features true state dependence. In other words, it determines whether experiencing poverty in a specific year, in itself, increases the probability of undergoing poverty in subsequent years. In particular, if $\rho > 0$, then experiencing poverty at time $t - 1$, $y_{it-1} = 1$, increases the chance to experience poverty at time $t$ ($y_{it} = 1$). Moreover, information about the direction of the relationship between unobserved individual characteristics and the level of poverty at the initial period is given by the estimate of $\alpha_1$. The estimate of $\sigma_a^2$ indicates the size of the dispersion that is attributable to the unobserved heterogeneity. Finally, note that Wooldridge's method has some advantages in facing selection and attrition problems

(e.g. problems that may arise using balanced data). In particular, as explained in Wooldridge (2005; pp. 44), it allows the selection and attrition to depend on the initial conditions and, therefore, it allows attrition to differ across initial levels of poverty. In particular, individuals with different initial statuses are allowed to have different missing data probabilities. Thus, we consider selection and attrition without explicitly modelling them as a function of the initial conditions. As a result, the analysis is less complicated and it compensates for the potential loss of information from using a balanced panel. Moreover, in the conditional MLE we can ignore any stratification that is a function of the initial level of poverty and of the time-invariant explanatory variable: In fact, using sampling weights leads to a loss of efficiency.

### 3.2 The three level random intercepts model

When individuals belong to different country/regions, the two level model is not appropriate. An individual living in a certain country/region tends to be more similar to the other individuals of that country/region than to some other individual living in a different country/region. As a result, standard errors may follow a country/regional dependency path. Ignoring this problem, i.e. pulling the data together, would produce downward biased estimated standard errors. Hence, significance test about the effects of country/regional covariates are not correctly estimated and may produce spurious "significant" results (Hox, 1995). As a result, a correct understanding of the macro drivers of poverty could be jeopardized. A simple solution could be that of using robust methods to estimate standard errors. However, multilevel models are more appropriate since they permit to fully exploit the hierarchical structure of the data.
We specify the following three-level dynamic logit model where the first level is the time, *t*, the second is the individual, *i,* and the third is the region, *k*= {1, 2 … 26}

(4) $$\tilde{y}_{ikt} = z_{ikt}\gamma + \rho y_{ikt-1} + \alpha_0 + \alpha_1 y_{ik0} + z_{ik}\alpha_2 + a_{ik} + v_k + u_{ikt}$$

where the dependent variable $y_{ikt}$ is the poverty state of individual *i* in region *k* at time *t*; $\alpha_0$, $\alpha_1$, $\alpha_2$ $\gamma$ and $\rho$ are the parameters to be estimated. $z_{ik}$ and $z_{ikt}$ are, respectively, vectors of time-constant and time-varying explanatory variables. $a_{ik}$ is the random intercept for individual *i* and $v_k$ is the random intercept for country/region *k*. The random intercepts are assumed to be independently normally distributed. Equation (4) represents a multilevel longitudinal model where we take into account both the dependence existing among observations of the same unit (individual) realized in different times and across different units belonging to the same state/region.

Before terminating this part, a word of caution is in order. Multilevel modelling and estimation of country effect might not provide robust conclusions about "country effects" when the number of countries is limited. Bryan and Jenkins (2015) show that with large sample sizes of individuals within each country but only a small number of countries, analysts can reliable estimates individual-level effects but estimates of parameters summarizing country effects could be unreliable (e.g. country random variances could be biased downwards and have confidence intervals that are too narrow). They suggest using at least 30 countries for logit model to safely estimate country-level parameters (to achieve a bias close to zero). However, the critical number of countries depends on a researcher's definition of acceptable accuracy and the model to be estimated. In a binary logit model with random intercept, the biases of the country-level covariate parameters and the country level random intercept variance become very small if the number of countries is at least 25: biases reduce to less than 5 per cent (Bryan and Jenkins, 2015). In our case, we will employ a

multilevel logit model with random intercepts in which the number of countries is 26. Moreover, our country covariates are time variant and we use three waves. Thus, we believe that estimates are accurate.

## 4. Data and indicators

We use the 2008-2011 longitudinal data of the EU Statistics on Income and Living Conditions (EU-SILC). The EU-SILC is a cross-sectional and longitudinal sample survey, coordinated by Eurostat, based on data from the EU member states. EU-SILC provides data on income, poverty, social exclusion and living conditions in the European Union. The advantage of the EU-SILC is that it permits us to analyze economic and social individual conditions from a dynamic point of view. To minimize sample selection and attrition problems our statistical analysis uses cross-sectional or the longitudinal weights available in the EU-SILC, as appropriate. However, as discussed in the previous section, we do not use weights in any of our econometric models, which would otherwise result in a loss of efficiency.

Using the EU-SILC, we define an individual as income poor if his/her household equivalent income is less than a chosen poverty line. The latter is defined as 60% of contemporaneous median income[6]. Note that, even if this may be seen as arbitrary, its use has become common practice in Europe and, therefore, it allows comparisons with other studies on poverty dynamics. The income variable considered is "equivalent household income", obtained after adding up income from all sources from any household member, and then dividing the result by the number of equivalent adults (using the OCED-modified equivalence scale). EU-SIlC also provides detailed data on individual and household characteristics. As indicators of micro determinants of poverty, we use information about gender, age, education (highest ISCD level attained[7]), consensual union, number of active members in the households, number of children aged under 14 in the household and existence of individuals with chronical diseases in the household. Descriptive statistics are in Table 1b.

Country specific covariates are obtained by different sources. Using the EU-SILC, we measure the size of the middle class. As discussed in section 3, there is no universally accepted definition of middle class. We use a popular and frequently used notion (see Pressman 2007; Grabka and Frick, 2008), where middle-class households are defined as those households whose adjusted household disposable income falls between 75 and 150 percent of median income. Then, we compute the size of the middle class in each country at a particular point in time. Thus, somebody who is middle class in a country might not be deemed middle class by the standards of some other country having a higher median.[8] See Table 1b for average national values over the period

[6] While we believe that either consumption or income is a useful aggregate money metric (monetary measure) of welfare, we acknowledge that both measures fail to incorporate some important aspects of individual welfare, such as consumption of commodities supplied by, or subsidized by, the public sector (for example, schools, health services, public sewage facilities) and several dimensions of the quality of life (for example, consumption of leisure and the ability to lead a long and healthy life). A significant disadvantage of our income measure, however, is the omission of homeless populations that would be expected to be poor.

[7] Low education is defined as ISCED 0-2, Medium education as ISCED 3-4, and High education as ISCED 5-6.

[8] In a study on poverty in developing countries, alternative approaches to measure middle class have been used. Ravallion (2009), Bhalla (2007) and Milanovic and Yitzaki (2002) set the bounds in a way that they have the same real value in different countries. Ravallion (2009) defines the overall lower bound as the median value of the poverty lines in developing countries (70 in his study) and the upper bound as the US-2005 poverty line. The alternative,

2009-2011. The Scandinavian nations of Denmark and Norway have the largest middle class (respectively, 72% and 75%) while Latvia, Spain, Bulgaria and Romania have the smallest middle class (about 50% or below).

We use the data on Government Effectiveness[9] released by the Word Bank. This variable reflects the perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation and the credibility of the government's commitment to such policies. The units in which this explicatory variable is measured follow a normal distribution with a mean of zero and a standard deviation of one in each period; this implies that the scores range between approximately –2.5 (weak) and 2.5 (strong) government performance. See Table 1a for descriptive.

We use Eurostat data on total public expenditure (as a percentage of GDP) and Social Expenditure (as a percentage of GDP). The former partially represents the "weight" of the public sector in each economy. Social Expenditure is an indicator of the generosity of the welfare state activity in each country.

Finally, we use the PPP Converted GDP Per Capita (Laspeyres) at 2005 constant price as provided in the Penn Tables.[10] Based on this variable we compute per-capita GDP growth to test whether economic growth reduces the exposition to the risk of poverty.

## 5. Results

The first step in our empirical strategy is to evaluate the importance of clustering. To do so, we estimate both the two-level and three level null models (without covariates). Then, we decompose the total variance into between and within clusters (individuals and countries) and compute intra-class correlation coefficients (ICC). In a simple two-level random intercept model ICC gives the correlation between units belonging to the same second level cluster and reflects therefore the "closeness" of latent responses in the same cluster relative to the "closeness" of latent responses in different clusters (Arpino and Aassve, 2007). Thus, the ICC for a two level model can be defined as the proportion of the total variance between the individuals:

(4) $$ICC_{tid} = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_v^2}$$

where $\sigma_u^2$ and $\sigma_v^2$ are the second and first level variances , respectively. The higher is the ICC the more important is the clustering. For a three-level model, the overall error term can be decomposed into three additive components (the first, the second and the third level variances), given the assumption of independence between random effects

more restricted, interval had 9$ PPP2005 lower cut-off level. As a result, the first interval defines an headcount of $F_t(13) - F_t(2)$ and the second an headcount of $F_t(13) - F_t(9)$ where $F_t(.)$ is the cumulative distribution function of personal income. The idea behind this approach is that an individual in the developing word is middle class if she/he is not poor in *any* developing country (first interval) or is not poor by Western (specifically, by US) standards. However, in our view, this approach is more appropriate in developing countries than in developed ones.

[9] World Bank, Worldwide Governance Indicators (WGI) http://info.worldbank.org/governance/ wgi/index.asp.

[10] https://pwt.sas.upenn.edu/php_site/pwt71/pwt71_retrieve.php

belonging to different levels. This implies that we can compute the interclass correlation between both individual variance (ICC_id) and country variance (ICC_cc):

$$ICC_{id} = \frac{\sigma_\alpha^2}{\sigma_\upsilon^2 + \sigma_\alpha^2 + \sigma_\omega^2} \quad (5)$$

$$ICC_{cc} = \frac{\sigma_\upsilon^2}{\sigma_\upsilon^2 + \sigma_\alpha^2 + \sigma_\omega^2} \quad (6)$$

where $\sigma_\upsilon^2$ is the third level variance.

Table 2 reports the variance decomposition and the ICC calculations for the null models. Results show that the cluster effects are considerable at both individual level and country level. Focusing on the two-level models, we find that about the 78% of the total variability is explained by the individual level while about the 22% of the total variability is explained by the time level. This is probably due to the impact of the economic crisis that took place during the period of study. Using the three level model, we can decompose the variation at individual level into the two components reflecting the individual and the country level. We find that the country level variation is about 4% of the total. This result demonstrates the importance of the clustering at regional level, justifying the use of a three level model.

In Table 2, we also report the variance decomposition and the ICC calculations for the null dynamic models that are models assuming a first order dynamics without including other covariates. The three three-level model is the most appropriate specification since we observe that about the 50% and the 2% of the total variability is explained by, respectively, the individual and the country levels. Assuming first order dynamics strongly decreases both the individual and country level variance. Thus, not only does the first order dynamics account for a substantial portion of within country variance but, by controlling for cross-country compositional differences in relation to the dynamics, it accounts for a certain proportion of the between country variance. However, even if the proportion of total variability explained by the country level is not so large, we believe that it is important to identify macro factors affecting the probability of being poor to identify appropriate policies. In this connection, notice that government effectiveness, social expenditure and the size of the middle class contribute to the determination of the probability of maintain/change a poverty status from a year to the next (see below).

5.1 The micro level determinants of poverty

Estimates of the evolution of poverty over time are reported in Table 3. Columns 2 and 3 presents the conditional maximum likelihood estimates and the asymptotic standard errors obtained using the dynamic logit model (two level model) that includes micro covariates. Columns 4 and 5 report the parameter estimates and the standard errors of the three level random intercepts model that also includes micro covariates.

In both the two and the three level models, after controlling for the unobserved effects, the coefficient on the lagged poverty is highly statistically significant. The initial value of poverty is also very important, and it implies that there is substantial correlation between the initial condition and the unobserved heterogeneity. In fact, the coefficient on initial poverty (2.9) is much larger than the coefficient on the lag (1.3). Moreover, the estimate of the variance of the random intercept for individuals ($\sigma_\alpha^2$) is positive and statistically significant. This means that there is large unobserved

heterogeneity across individuals, even after explicitly controlling for the heterogeneity that we can observe. In facts, the inclusion of the observed individual characteristics reduces the proportion of the total variability explained by the individual level from 49.7% to 45.6% (see Tables 2 and 3, there levels models). The specifications include the following observed individual socio-demographic characteristics: some time-varying individual variables (plus the corresponding time-constant individual dummies) representing the proportion of active household members, the presence of individuals with chronical diseases (that lead to strong limitations in daily activities) in the household and the presence of children aged under 14 in the household. We also control for some base-year time constant individual variables such as sex, age, age squared and level of education (high or medium). Period dummy variables are also included to capture a possible time trend.

The level of education (high and medium) significantly reduces the probability of experiencing poverty. The chance to be poor seems to decrease when the proportion of household active members increases. Note that we include for each time-varying individual variable, the corresponding time-invariant individual dummies in order to allow for a correlation between the individual specific effects and the time-varying variables. We find that the probability of experiencing poverty increase in households with more children, on average, over the period of study. The coefficient of the gender is not significant in all specification. The coefficients on age and its square indicate that an increase in an individual's age increases the probability of experiencing poverty, but this phenomenon reverses in old age (around 42 years old).

In the three level specifications, the estimate of the variance of the random intercept for countries ($\sigma_{u}^{2}$) is positive and statistically significant, even after controlling for the individual observed heterogeneity. The inclusion of the observed individual socio-demographic characteristics only slightly reduce the proportion of the total variability explained by the country (from 2.1% to 1.4%). Unobserved heterogeneity across countries is small, but it remains across countries: some individuals are more inclined to escape poverty than other individuals do simply on the basis the countries they live in.

5.2 The macro level determinants of poverty

In this subsection, we focus on country heterogeneity disentangling the role of observed and unobserved heterogeneity at country level. In particular, we test the impact of the following possible macro determinant of poverty persistence: the quality of government (e.g. the quality of public services, the quality of policy formulation and implementation) and the size of the middle class. To do so, we define a dummy for high government effectiveness equal to one if the country is in the top quartile of the distribution of the specific indicator (i.e. countries with good quality of government). We also control for the social policy generosity (social expenditure as a percentage of GDP), the weight of the public sector (total public expenditure as a percentage of GDP) and the GDP growth (as proxy for changes in average availability of resources for the entire society). Estimates are reported in Table 4.

We find a negative correlation between social expenditure and poverty. This result is in line with previous findings (Jenkins, 2000, Dewilde, 2008, Whelan et al., 2008, Kenworthy et al., 2011 and Bárcena-Martín et al. 2013). We find an unexpected positive correlation between poverty and total expenditure. These findings may indicate that the poor mainly capture the effects of possibly selective social expenditures but are at best unaffected by general expenditure. This can be due to the

difficulties of general total public expenditure (comprehensive, for instance, of financial and military components) to strengthen human capabilities and alleviate social distress. Moreover, a too large public sector may take resources away from alternative possible uses[11]. When the latter are "pro-poor uses", a too large public sector may increase the risk of poverty.

We stress the finding that the individual probability of being poor is lower in countries with high government effectiveness. Estimated coefficients are statistically significant and show the expected signs. The perception of the effectiveness of the government activity can be seen as a proxy of the extent to which citizens fill that the administrative machine is fulfilling its obligations with a minimum of waste of resources. Moreover, a high quality of public action reduces exposition to poverty risk by possibly reducing the occasions for private sector rent-seeking activities, such as corruption. On the contrary, where the quality of government activity is ranked low, it is likely that a huge amount of resources is subtracted to potentially productive legal uses and channeled, broadly speaking, into the above mentioned area of rent seeking. This implies that efficient allocation decisions are more difficult and that redistribution policy can be jeopardized. Finally, we notice that, more in general, governance variables may represent some of those unobserved factors that explain cross-country differences in exposition to poverty risk.

The original specific factor included in the present multi-level study is the size of countries' middle class. Of course, quoting Banerjee et al. (2008, 3), there is nothing new about a faith in the middle class. What is new is that robust estimations of this (expected) effect is obtained by controlling for cross-country compositional differences in relation to the dynamics of poverty, and so it accounts for a certain proportion of the between country heterogeneity. This result was never achieved before. Estimates show that the larger the size of the middle class the higher the reduction of poverty. This can be interpreted as a sign of the fact that, in Europe, a larger middle class promotes a pro anti-poverty environment by increasing country standards (i.e. law, justice, entrepreneurship, etc.) and by easing the assimilation of UE policies into domestic legislation and praxis. A large middle class can also reduce the negative impact of credit market failures on human capital accumulation and then on poverty. This implies that a large middle class may reinforce the impact of social expenditure on poverty reduction.

Finally, we observe a negative, but not significant, relationship between poverty and GDP growth. This result is in line with some previous studies. For example, employing a deprivation index for developed countries, Boarini et al. (2006) and Kenworthy et al. (2001) find no association between per capita GDP and material deprivation. On the contrary, in a model in which basic deprivation is regressed against both household income and per capita gross national disposable income (in deviation from the mean), Whelan et al. (2012) find a negative significant relation between deprivation and per capita disposable income but the estimated coefficient sharply decreases when micro variables are included as regressors. Bárcena-Martín et al. (2013) obtain similar results in a multi-level model of frequency-based weighted material deprivation using GDP as a macro regressor.

[11] When a large portion of total public expenditure is represented by the (domestic and external) service of a huge public debt, the tax yield–interest expenditure circle might even produce anti poor distribution results and reduce the pro-poor effects of middle class pressure for welfare state (theoretically, pro-poor) measures. Coupled with financial deregulation, this might induce a rising poverty/inequality.

As a final comment, we stress that, although the inclusion of the macro variables produces only a small reduction in log likelihood ratio estimates (or, putting it more bluntly, although the introduction of macro variables adds little to the explanatory power of the micro variables), still it permits to evaluate factors that may be of interest for designing future policies.

5.3 True state dependence dynamics

We estimate the average partial effects in order to evaluate the importance of the dynamics. We compute the magnitude of partial effects to analyze the relevance of state dependence on the probability to experience poverty, conditional on the poverty status in the previous period. For the two level dynamic logit model, we use the consistent estimator proposed by Wooldridge (2005):

$$N^{-1}\sum_{i=1}^{N}\Phi\left(z_{it}\hat{\gamma}+\hat{\rho}_a y_{t-1}+\hat{a}_{0a}+\hat{a}_{1a}y_{i0}+z_i\hat{a}_{2a}\right) \quad (7)$$

where the parameters are the estimated ones and the $a$ subscript indicates a multiplication by $(1+\hat{\sigma}_u^2)^{-\frac{1}{2}}$. For the three level model with random intercepts, we use equation (7) where the $a$ subscript refers to a multiplication by $(1+\hat{\sigma}_\alpha^2+\hat{\sigma}_v^2)^{-\frac{1}{2}}$. Estimates of the probability of being poor in year *t* given that the individual is or is not poor in year *t*-1 are in Table 5. The difference is an estimate of the state dependence of being poor. In the two level model, the probability to experience poverty given that the individual is poor the previous year is 0.216, while it decreases to 0.129 if the individual is not poor the previous year. Thus, the estimate of the state dependence of poverty is about 0.087. However, the estimate of the true state dependence decreases to 0.059 when we control for country observed and unobserved characteristics (three level model). This means that individuals experiencing poverty in the former period have 6% higher probability of being poor than those not experiencing poverty the year before. Thus, we can conclude that individuals living in a certain country and experiencing poverty in a certain period have a higher probability to experience poverty in the future than non-poor individuals of that same country do. Country factors reduce this probability for the impact on the dynamics of the past poverty depends on the macro and institutional context. The estimate of the true state dependence in countries characterized by low social expenditure, low government effectiveness and limited middle class is 0.080 and it decreases to 0.036 in countries characterized by high social expenditure, high government effectiveness and extended middle class. It is generally recognized that poverty reduction/persistence can be the result of different institutional types of welfare states for institutional differences (selectivity vs. universality) may lead to unexpected outcomes. In some cases, selectivity is successful and in some other cases it may generate the so called paradox of redistribution: the more we target benefits at the poor and the more concerned we are with creating equality via equal public transfers to all, the less likely we are to reduce poverty and inequality. Results discussed in this subsection show that the *paradox* could be a misplaced concern. High social expenditure (basically, the result of selective measures) coupled with high institutional quality

## 6. Conclusions and policy perspectives

Using the 2008-2011 EU-Statistics on Income and Living Conditions data, we implement a dynamic three-level model to analyze poverty persistence in the 26 EU countries. We innovate with respect to the existing literature by disentangling the effects of observed and unobserved heterogeneity at country level on the process that may generate a persistence of poverty. In particular, we analyze for the first time whether and how the quality of public institutions (e.g. the quality of public services, the quality of policy formulation and implementation, the perception of the fairness of the legal rules, etc.) as well as the size of the middle class in each country affect individual risk of poverty and its dynamics.

The multi-level analysis shows the following results. *First*, we find that unobserved heterogeneity across individuals remains large, even after explicitly controlling for the part of individual heterogeneity that can be observed. *Second*, we find that some individuals have higher probability to escape poverty than others do based on their residential country. This is an indication of unobserved heterogeneity across countries. *Third*, poverty persistence is negatively related to the quality of government activity (e.g. to the quality of public services, the quality of policy formulation and implementation, the perception of the fairness of the legal rules, etc.) and to the size of the middle class. *Fourth*, individuals experiencing poverty at a certain point in time have a higher probability to experience poverty in the future than non-poor individuals do (i.e. there is evidence of true state dependence). *Fifth*, the estimate of the true state dependence in countries characterized by low social (generally poor oriented) expenditure, low government effectiveness and limited middle class is much higher than the one observed in countries characterized by high social expenditure, high government effectiveness and extended middle class. This means that good institutions combined with high social expenditure may help reducing the adverse impact of experiencing poverty in a specific period.

Recall that the EU in 2020 has five anti-poverty targets i) employment (75% of the 20- to 64 year-olds to be employed); ii) R&D (3% of the EU's GDP to be invested in R&D); iii) climate change and energy sustainability (greenhouse gas emissions 20% – or even 30%, if the conditions are right – lower than 1990, 20% of energy from renewables and 20% increase in energy efficiency); iv) education (reducing the rates of leaving school early school to below 10%; at least 40% of 30- to 34–year-olds completing tertiary-level education); v) fighting poverty and social exclusion (at least 20 million fewer people in or at risk of poverty and social exclusion). These targets are interrelated and mutually reinforcing: educational improvements help employability and reduce poverty; more R&D/innovation in the economy induces more competitiveness and creates jobs; and investment in cleaner technologies combats climate change while also creating new business/job opportunities.

Results indicate that poverty risk and social exclusion are affected by more factors than growth of income alone, which should not be overemphasized as it is in the above EURO list of goals/instruments (as well as in the current debate) as a sort of prerequisite to obtain poverty reduction. Social expenditure and institutional quality are at least of equal importance as it is the size of the middle class. On the contrary, general government expenditure has a non-significant effect on poverty, which suggest specific policy guidelines to member states (expenditure selectivity) but not policies of expenditure cuts to cure poverty.

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Table 1a. *Descriptive statistics: macro context* (average values)

| Period 2009-2011 | Poverty | Middle class | Government effectiveness | Total government Expenditure (% GDP) | Social Expenditure (% GDP) | GDP growth |
|---|---|---|---|---|---|---|
| Austria AT | 9.10% | 63.50% | 1.76 | 52.45 | 41.42 | 0.20% |
| Belgium BE | 10.40% | 60.70% | 1.62 | 53.30 | 36.40 | 0.55% |
| Bulgaria BG | 17.10% | 50.30% | 0.02 | 38.32 | 36.59 | 0.14% |
| Cyprus CY | 12.40% | 55.70% | 1.49 | 46.03 | 25.07 | -1.03% |
| Czech Republic CZ | 5.10% | 71.90% | 1.00 | 45.51 | 31.51 | 1.59% |
| Denmark DK | 7.90% | 72.30% | 2.20 | 57.64 | 43.61 | -0.61% |
| Estonia EE | 9.00% | 55.40% | 1.19 | 43.08 | 35.46 | -0.41% |
| Greece EL | 14.50% | 52.80% | 0.52 | 50.49 | 36.75 | -2.30% |
| Spain ES | 15.30% | 50.60% | 0.98 | 44.86 | 36.46 | -1.32% |
| Finland FI | 8.70% | 62.80% | 2.24 | 55.46 | 43.02 | -0.40% |
| France FR | 9.60% | 60.10% | 1.42 | 56.21 | 42.28 | -0.71% |
| Hungary HU | 9.30% | 64.40% | 0.70 | 48.74 | 35.97 | -0.67% |
| Italy IT | 15.80% | 54.50% | 0.48 | 50.85 | 40.32 | -0.74% |
| Lithuania LT | 15.50% | 51.70% | 0.69 | 42.47 | 34.79 | -1.49% |
| Luxemburg LU | 9.00% | 55.70% | 1.73 | 42.65 | 61.90 | -0.52% |
| Latvia LV | 15.70% | 47.00% | 0.67 | 42.63 | 31.69 | -2.31% |
| Malta MT | 11.00% | 57.30% | 1.15 | 44.24 | 33.40 | -0.04% |
| Nederland NL | 7.40% | 69.00% | 1.76 | 51.25 | 33.72 | -0.20% |
| Norway NO | 4.50% | 75.10% | 1.63 | 43.90 | 39.47 | -0.02% |
| Poland PL | 12.30% | 54.60% | 0.67 | 41.74 | 37.57 | 1.58% |
| Portugal PT | 12.00% | 51.50% | 1.05 | 48.09 | 33.57 | -0.57% |
| Romania RO | 17.00% | 50.80% | -0.20 | 39.28 | 30.18 | -1.93% |
| Sweden SE | 7.10% | 68.90% | 2.00 | 52.84 | 41.38 | 1.00% |
| Slovenia, SI | 6.80% | 69.70% | 1.05 | 49.26 | 36.58 | -1.16% |
| Slovakia SK | 8.30% | 68.30% | 0.87 | 39.63 | 30.40 | 0.45% |
| United Kingdom UK | 12.70% | 51.10% | 1.54 | 49.57 | 35.41 | 0.30% |
| Mean | 10.90 | 59.45 | 1.16 | 47.32 | 37.11 | -0.40 |
| Median | 10.00 | 56.50 | 1.09 | 47.05 | 36.43 | -0.46 |
| Maximum | 17.10 | 75.10 | 2.24 | 57.63 | 61.90 | 1.59 |
| Minimum | 4.50 | 47.00 | -0.20 | 38.31 | 25.07 | -2.31 |
| Std. Dev. | 3.67 | 8.26 | 0.62 | 5.46 | 6.69 | 1.01 |

Fig. 1 *Scatter Matrix of Macro-Determinants*

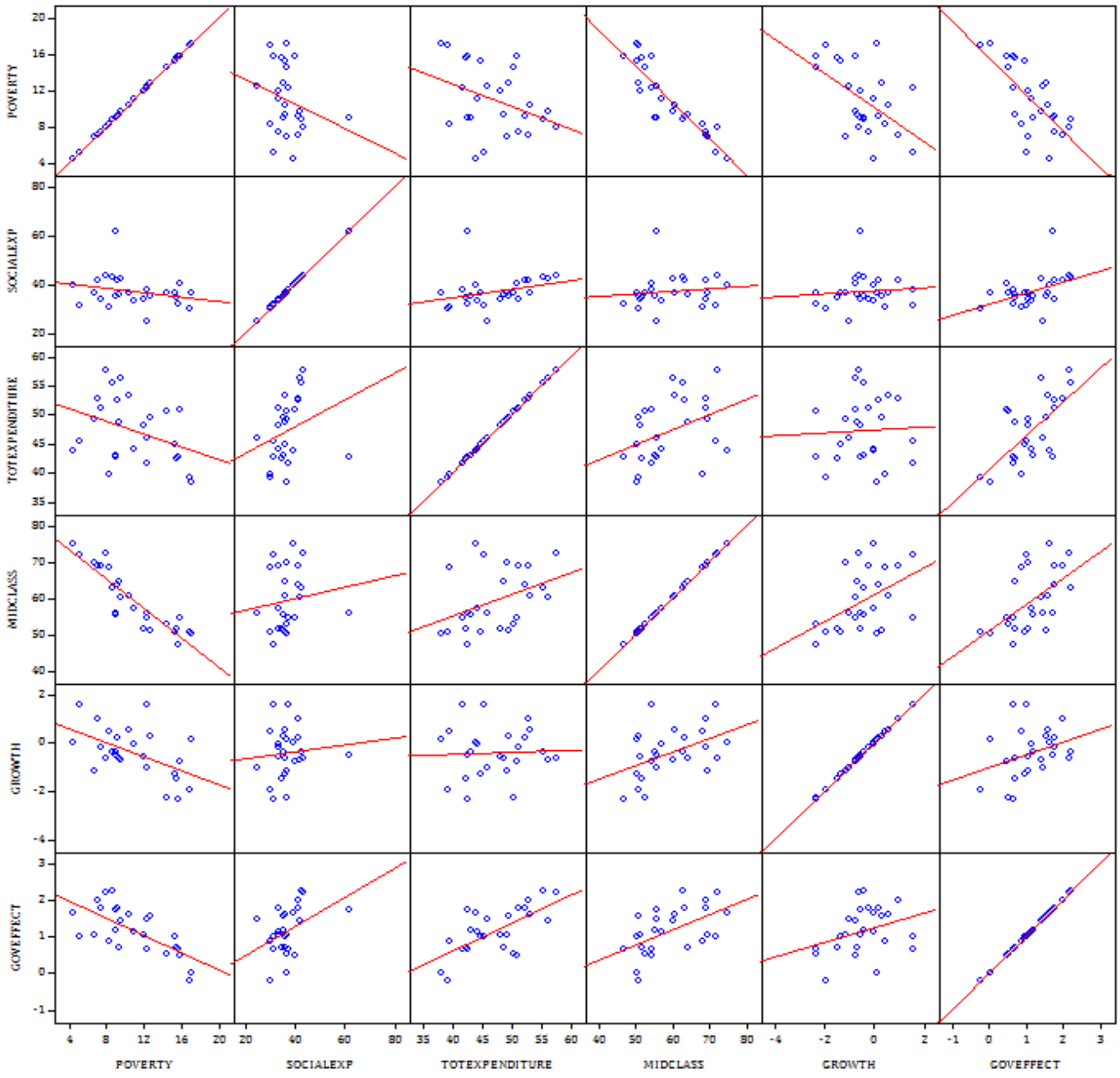

Table 1a. *Descriptive statistics: socio-demographic characteristics*

| **Variable** | **Period 2009-2011** |
|---|---|
| Females (%) | 50.43% |
| Medium education (%) | 43.79% |
| High education (%) | 21.48% |
| Age (mean) | 48.57 |
| % households having individuals with chronical diseases | 13.58% |
| No. active members in the household | 1.55 |
| No. children under 14 in the household | 0.40 |

Table 2. *The null model. Dependent Variable: Poverty at time t*

| **Static model** | | | | | | |
|---|---|---|---|---|---|---|
| | 2-levels model | | | 3-levels model | | |
| | coefficient | | SE | coefficient | | SE |
| *Constant* | -4.8747 | ** | 0.0235 | -3.0524 | ** | 0.0312 |
| var(individual) | 11.589 | ** | 0.0226 | 9.6944 | ** | 0.1298 |
| var(country) | | | | 0.5756 | ** | 0.0244 |
| $ICC_{id}$ | 77.9% | | | 71.5% | | |
| $ICC_{country}$ | | | | 4.2% | | |
| Log likelihood | -69560 | | | -69003 | | |
| **Dynamic model** | | | | | | |
| | 2-levels model | | | 3-levels model | | |
| | coefficient | | SE | coefficient | | SE |
| *poverty_t-1* | 1.3490 | ** | 0.0428 | 1.346 | ** | 0.041 |
| *poverty(2008)* | 3.6121 | ** | 0.0760 | 3.499 | ** | 0.072 |
| *Constant* | -4.5420 | ** | 0.0459 | -4.162 | ** | 0.041 |
| var(individual) | 3.4974 | ** | 0.0377 | 3.398 | ** | 0.129 |
| var(country) | | | | 0.143 | ** | 0.011 |
| $icc_{id}$ | 51.5% | | | 49.7% | | |
| $icc_{country}$ | | | | 2.1% | | |
| Log likelihood | -44592 | | | -44252.956 | | |
| Level 1 variance = | | | | | | 3.2899 |

Table 3. *Estimates of the poverty dynamics: micro determinants. Dependent Variable: Poverty at time t*

| Poverty (t) | 2-levels model | | | 3-levels model | | |
|---|---|---|---|---|---|---|
| | coefficient | | SE | coefficient | | SE |
| *poverty_t-1* | 1.3620 | ** | 0.0414 | 1.3431 | ** | 0.0408 |
| *sex* | -0.0017 | | 0.0279 | -0.0119 | | 0.0279 |
| *age* | 0.0203 | ** | 0.0047 | 0.0221 | ** | 0.0047 |
| *age²* | -0.0005 | ** | 0.0000 | -0.0005 | ** | 0.0000 |
| *Medium education* | -0.7496 | ** | 0.0310 | -0.6971 | ** | 0.0318 |
| *High education* | -1.7228 | ** | 0.0508 | -1.6799 | ** | 0.0507 |
| *No. active members* | -0.5378 | ** | 0.0293 | -0.5379 | ** | 0.0294 |
| *No. children under14* | -0.0821 | | 0.0488 | -0.0901 | | 0.0490 |
| *chronical diseases in the household* | 0.0810 | | 0.0500 | 0.0817 | | 0.0501 |
| *wave dummies* | yes | | yes | yes | | yes |
| *poverty(t=2008)* | 3.0308 | ** | 0.0666 | 2.9499 | ** | 0.0646 |
| *longitudinal average variables: active members* | -0.0831 | * | 0.0360 | -0.1335 | ** | 0.0362 |
| *longitudinal average variables: children under14* | 0.5108 | ** | 0.0523 | 0.5358 | ** | 0.0525 |
| *longitudinal average variables: illness* | 0.0919 | | 0.0725 | 0.0395 | | 0.0732 |
| *Constant* | -2.7576 | ** | 0.1157 | -2.4337 | ** | 0.1158 |
| var(id) | 2.8728 | ** | 0.0348 | 2.8355 | ** | 0.1141 |
| var(country) | | | | 0.0890 | ** | 0.0076 |
| $ICC_{id}$ | 46.6% | | | 45.6% | | |
| $ICC_{country}$ | | | | 1.4% | | |
| Log likelihood | -42648.9 | | | -42374.3 | | |
| No. Observations | | | 210.243 | | | 210.243 |
| No. Individuals | | | 70.152 | | | 70.152 |
| No. Countries | | | 26 | | | 26 |

Table 4. *Estimates of the poverty evolution: micro and macro determinants*

| Poverty (t) | 3-levels model | | |
|---|---|---|---|
| | coefficient | | SE |
| *poverty_t-1* | 1.3197 | ** | 0.0410 |
| *sex* | -0.0054 | | 0.0281 |
| *age* | 0.0139 | ** | 0.0051 |
| *age2* | -0.0005 | ** | 0.0001 |
| *Medium education* | -0.7121 | ** | 0.0321 |
| *High education* | -1.6821 | ** | 0.0514 |
| *consensual union* | -0.0759 | ** | 0.0172 |
| *No. active members* | -0.5501 | ** | 0.0296 |
| *No. children under14* | -0.0873 | | 0.0491 |
| *chronical diseases in the household* | 0.0768 | | 0.0502 |
| *High government effectiveness (t-1)* | -0.1852 | ** | 0.0545 |
| *% middle class (t-1)* | -3.3504 | ** | 0.2326 |
| *Total gov. exp. as % of GDP (t-1)* | 0.0071 | * | 0.0033 |
| *Social expenditure as % of GDP (t-1)* | -0.0360 | ** | 0.0041 |
| *GDP growth* | -0.7946 | | 0.4892 |
| *wave dummies* | yes | | yes |
| *Poverty (2008)* | 2.9712 | ** | 0.0649 |
| *longitudinal average variables: active members* | -0.1457 | ** | 0.0364 |
| *longitudinal average variables: children under14* | 0.5113 | ** | 0.0527 |
| *longitudinal average variables: illness* | 0.0340 | | 0.0731 |
| *Constant* | 0.4635 | | 0.2549 |
| var(id) | 2.8878 | ** | 0.1159 |
| var(country) | 0.0810 | ** | 0.0113 |
| $ICC_{id}$ | 46.1% | | |
| $ICC_{country}$ | 1.3% | | |
| Log likelihood | | | -42311.4 |

Table 5. *True state dependence of Poverty at time t*

| Probability | poverty(t-1)=1 | poverty(t-1)=0 | True state dependence |
|---|---|---|---|
| two level logit model | 0.2160 | 0.1291 | 0.087 |
| three level logit model (with macro variables) | 0.152 | 0.093 | 0.059 |
| three level logit model (with macro variables) at different realizations | | | |
| middle class=0.4 & government effectiveness=0 & social expenditure =25 | 0.219 | 0.140 | 0.080 |
| middle class=0.4 & government effectiveness=0 & social expenditure =60 | 0.143 | 0.086 | 0.057 |
| middle class=0.4 & government effectiveness=1 & social expenditure =60 | 0.133 | 0.080 | 0.054 |
| middle class=0.75 & government effectiveness=1 & social expenditure = 25 | 0.138 | 0.083 | 0.055 |
| middle class=0.75 & government effectiveness=1 & social expenditure =60 | 0.085 | 0.048 | 0.036 |