Childbirth and poverty in Europe: A dynamic bivariate approach

Abstract

We use the 2015–2018 European Union Statistics on Income and Living Conditions panel data and a dynamic bivariate probit model to estimate the impact of childbirth on the risk of poverty in 25 European countries. We model both poverty and childbirth mechanisms, identifying genuine state dependence and accounting for feedback effects from past poverty to childbirth.

We find that childbirth slightly increases the risk of poverty in Europe, but some heterogeneities emerge at the country level. When disentangling the effects of childbirth conditional on past poverty status, it appears that childbirth determines redistributive effects possibly induced by welfare systems. We find evidence of genuine state dependence and suggests that discouraging factors induced by the experience of poverty itself has increased over time. The risk of poverty is triggered by the presence of dependent members in the household, while education and employment stability are helpful to combat poverty.

JEL codes: I32, J13, C33

Keywords: poverty, childbirth, genuine state dependence, feedback effects.

1. Introduction

Over the last decades, poverty has become a troubling phenomenon in Europe, and the current pandemic is worsening this pattern. Despite the adoption of contrasting measures, poverty persisted at relatively high levels and has even increased in certain countries usually characterized by low poverty rates (e.g., Sweden and the Netherlands). For the evolution of poverty in European countries since the onset of the Great Recession, see Figure A1 in the Appendix.

Jenkins (2020) identifies a number of causes that may explain this disappointing trend. In the period before the onset of the global financial crisis of 2008, known as the Great Recession, he highlights the role played by the rise of low-paid jobs and the decline of passive income support policies (Cantillon, 2011). In the period after, the rise in unemployment and the financial stress caused by the Great Recession negatively affected household incomes in Europe, and some countries (e.g., the southern ones) particularly suffered from the implementation of contractionary fiscal policies and labor market deregulation, increasing the socioeconomic vulnerability of societies. Thus, understanding the origins of poverty is relevant for designing effective contrasting policies capable of restoring acceptable levels of economic inequality.

Poverty is particularly relevant for certain population groups: young people, single parents, and single-earner families with children appear to suffer a greater disadvantage (e.g., Gornick and Jäntti, 2012; Scherer and Grotti, 2014). In addition, the risk of poverty may be associated with triggering events like job loss (McKernan and Ratcliffe, 2005) and low-paying jobs (e.g., Lucifora et al., 2005), changes in household composition (Biewen, 2009) and leaving the parental home (Ayllòn, 2015).

Quite surprisingly, few studies have devoted specific attention to the role of childbirth in poverty in Europe, despite childbirth being a potential key event for poverty onset as it threatens both the households' income needs and household time allocation (e.g., Vandecasteele, 2010). For example, childbirth decreases one's disposable equivalent income, unless child-related public transfers are great enough to compensate the loss of equivalent income. In addition, childbirth is often associated with a reduction in household labor supply, especially through the reduction of working hours or even the labor market exit of mothers, as documented by a wide range of papers examining the relationship between childbearing and female employment (e.g., Del Boca et al., 2005; Herrarte et al., 2012; Fitzeberger et al., 2013). One of the few contributions on the topic is that of Barbieri and Bozzon (2016), which showed that childbirth increases the risk of entering poverty in Europe, although the magnitude of the impact depends on the national welfare system and household labor market conditions.

This paper focuses on poverty in Europe, analyzing the 2015–2018 European Union Statistics on Income and Living Conditions (EU-SILC) survey panel data for 25 European countries, and contributes to the literature in three main ways. First, we study whether and how childbirth affects poverty in Europe. By exploiting the longitudinal structure of the data, we assume that both processes are dynamic and allow for possible the endogeneity of childbirth. The relationship between fertility and income conditions has been a long-standing issue in economics and demography. Malthus's (1798) famous essay hypothesized the existence of a positive nexus between income and fertility. This view was confirmed by, among others, Gregory Clark (see, for instance, Clark and Hamilton, 2006; Clark and Cummins, 2009; Clark and Cummins, 2015). This evidence suggests that an increase in income should increase both the quantity and quality of children and/or that wealth is strongly and positively correlated with net fertility. However, Clark and Cummins (2015) note that the net fertility of the poor equaled that of the rich at the end of the 19th century. Moreover, the modern approach to fertility (e.g., Becker, 1992) countervails the Malthusian view and demonstrates that income growth is associated with a decrease in fertility rates. We therefore cannot rule out the possibility that childbearing decisions may be endogenously determined by income conditions, and accounting for this is relevant. Second, thanks to the possibility of modeling both poverty and childbearing processes, we explicitly study the way past poverty status affects childbearing decisions. This is important because low fertility rates represent another sore subject for Europe and understanding the poverty–childbirth relationship would provide insight into the decrease in childbearing that characterizes many European countries.[1] Finally, our analysis accounts for state dependence, unobserved heterogeneity, and endogenous initial conditions. This allows us to decompose poverty persistence into genuine state dependence and observable and unobservable factors. As is well known, the presence of genuine state dependence is indicative that current poverty *per se* causes future poverty, thus suggesting that measures capable of moving individuals above the poverty line would be effective to contrast poverty. Previous studies estimating poverty persistence in Europe include Devicienti and Poggi (2011), Ayllón (2013), Ayllón and Gàbos (2017), Giarda and Moroni (2018), and Bosco and Poggi (2020). In this regard, our study provides an estimate of state dependence at the European level in the pre-pandemic period.

Given the potentially interrelated structure of the poverty–childbirth relationship, our empirical strategy consists in estimating a dynamic bivariate probit model that relaxes the assumption of strict exogeneity of childbirth and explicitly models both poverty and childbearing processes by assuming childbirth may depend on past poverty status. Thus, our joint estimation strategy accounts for feedback effects from past poverty to childbirth. A similar empirical strategy has been adopted both in studies analyzing key events for poverty (e.g., Biewen, 2009; Ayllón, 2015) and by Michaud and Tatsiramos (2011), who estimated the impact of fertility decisions on employment.

Our estimates reveal that childbirth increases the risk of poverty. The effect is relatively small, however, and it may determine redistributive effects, depending on the generosity of the welfare system. When disentangling this effect at the country level, we find that it is essentially positive in Western European countries and negative in Eastern ones.

[1] In the 2010–2018 period, live births decreased by 8% on average in the EU-28, with peaks of over 20% in Italy, Spain, Greece, and Finland.

Finally, we find evidence of genuine state dependence, which seems to be slightly smaller for individuals living in households where there was a birth, as well as increasing discouraging factors induced by the experience of poverty itself over time in Europe.

The paper is organized as follows. Section 2 reviews the existing literature. Section 3 presents the dataset and provides descriptive statistics. The empirical model is described in Section 4. Section 5 discusses the main findings, and Section 6 offers some concluding remarks.

2. Literature review

Few studies have devoted specific attention to the role of childbirth in poverty in Europe, despite childbirth being defined as a potential key event that triggers poverty entries and exits since it threatens both household income needs and time allocation (e.g., McKernan and Ratcliffe, 2005; Vandecasteele, 2010). More papers have instead investigated the connection between income conditions and childbirth in developing countries. The existing literature shows that the relationship between poverty and childbirth is not unidirectional (e.g., Birdsall et al., 2001). Some studies suggest a positive relationship between poverty and childbirth, others find it to be negative, and still others find it to have an inverse J-shaped relation. The literature has tried to reconcile these discrepancies by differentiating countries by their level of economic development and their stage of demographic transition (e.g., Moav, 2005; Libois and Somville, 2018; Wietzke, 2020).

During recent decades, poverty and economic vulnerability trends across the developed countries of the European Union have increased (Cantillon et al., 2019), especially for some vulnerable population categories such as young people, single parents, and single-earner families with children (Gornick and Jantti, 2012; Scherer and Grotti, 2014). In terms of poverty rates, the frequency and duration of poverty spells varies systematically across countries (Fouarge and Layte, 2005) and seems to be associated with welfare systems (Pintelon et al., 2013; Whelan et al., 2014). Moreover, again in developed countries childbirth increasingly represents a poverty-triggering event because it destabilizes both the household’s level of need and the family/work balance.

Given the importance of both poverty and childbirth in European countries, there is a need to study their determinants as well as their interrelation. We attempt to help fill this gap in the literature, seeing as most of the available literature on Europe analyses either the phenomenon of poverty or that of childbirth. In the past 20 years, the literature on poverty has focused on “longitudinal poverty”, analyzing the characteristics of households that are at risk of being permanently poor or socially excluded.

Among the single- and multi-country studies we find, for example, Devicienti and Poggi (2011) for Italy, Ayllón (2013) for Spain, and Ayllón and Gábos (2017), Giarda and Moroni (2018), and Bosco and Poggi (2020) for European countries. A common feature of these studies is that despite using different econometric techniques and investigating different (European) countries, they find evidence of relatively high genuine poverty state dependence, especially in Southern European countries.

Devicienti and Poggi (2011) and Ayllon (2013) use the European Community Household Panel (ECHP) over the period of 1994–2001. The former work explores Italy and extends Wooldridge's (2005) approach to a bivariate dynamic model, while the latter analyzes Spain by following the model proposed by Cappellari and Jenkins (2004), which allows the estimation of state dependence while controlling for attrition and initial conditions. As for studies investigating multiple European countries, Ayllón and Gábos (2017), Giarda and Moroni (2018), and Bosco and Poggi (2020) use EU-SILC data to investigate the nature of poverty state dependence. Ayllón and Gábos (2017) use a probit model with feedback effects accounting for initial conditions (Wooldridge, 2005; Biewen, 2009) and the time-average of time-varying covariates (Stewart, 2007). Giarda and Moroni (2018) use different specifications of Heckman's dynamic random effects probit model, while Bosco and Poggi (2020) implement a three-level dynamic model by extending the technique proposed by Wooldridge (2005).

As far as childbirth is concerned, the literature mainly analyses its relationship with female employment. Childbirth is indeed often associated with a reduction in household labor supply, especially through the reduction of the working hours of mothers as well as the decision to withdraw from paid work. The studies by Del Boca et al. (2005) on Italy, Herrarte et al. (2012) on Spain, and Fitzeberger et al. (2013) on Germany, for instance, find that childbirth reduces the labor supply of women and therefore indirectly affects household poverty by reducing labor income.

One of the few contributions on the direct association between childbirth and poverty in European countries is by Barbieri and Bozzon (2016). The authors investigate the direct relationship between childbirth and poverty in Europe by using EU-SILC longitudinal data from 2007, 2008, and 2009 and grouping countries according to four types of welfare system. They estimate panel random effects probit models and use propensity score matching. Their findings suggest that childbirth increases the risk of entering poverty, although the impact depends on the national welfare regime[2] and household labor market conditions. Overall, the presence of a child below the age of 2 increases the risk of becoming poor in all countries but the Nordic ones. Poverty risks are highest for single-earner families with precarious employment situations and for employed single women. This pattern, consistent with previous studies (see, for instance, Barbieri and Cutuli, 2010), is far more pronounced in Southern European and conservative countries, which are characterized by a strongly segmented labor market and have higher penalties for outsiders.

[2] The role of welfare regimes in shaping poverty profiles is also explored by studies such as Fouarge and Layte (2005), and Maître et al. (2005).

3. Data and sample

We analyze data from the EU-SILC survey, which is conducted in most European Union countries by the relevant national institutes of statistics using harmonized definitions and survey methodologies (Eurostat, 2010). The topics covered by the survey encompass living conditions, income, social exclusion, housing, work, demography, and education. Our analysis considers the longitudinal sample of individuals/households interviewed in at least three of the four successive waves that took place between 2015 and 2018. We select data for twenty-five European countries. Potentially, the EU-SILC survey includes all European countries, but at the time of this work fresh data for some countries were not available. We focus on households with a woman of childbearing age, that is, in the age range of 18 to 50 years. We estimate the poverty and childbirth equation by adopting a model with a recursive structure (for details, see Section 4) in the twenty-five countries analyzed for the period of 2015–2018.

Therefore, poverty and childbirth are our variables of interest. Poverty is defined as the fraction of people living with an equivalized income below a threshold defined as 60% of the national median. Equivalized income is the total disposable household income (after taxes and social transfers) divided by an equivalized household size calculated according to the modified OECD scale. Due to the limited number of observations and in line with the existing literature (see, for instance, Barbieri and Bozzon, 2016), childbirth is defined as a new birth either in the current or in the previous year to the surveyed period. The inclusion of the previous year's births is to avoid misreporting and to account for the fact that the previous year of the EU-SILC survey coincides with the income year (for instance, for the 2015 survey year the income is from 2014—it is retrospective information), as well as because of the biological lag in decision-taking until childbirth.

Table 1 displays the poverty and childbirth rates (average for the 2015–2018 period) computed for our (unbalanced) sample by country, as well as the relative (by country) sample size. The overall sample size is 230,673 observations. We note that the average poverty rates range from 6.78% for Denmark to 26.03% for Serbia. At the bottom of the poverty rate distribution, we also find Norway (7.15%), the Netherlands and the Czech Republic (8.26% and 8.64%, respectively), and Austria and Finland (9.11% and 9.13%, respectively), while at the top we also find Romania (25.18%), Greece (23.30%), and Spain and Italy (22.88% and 21.71%, respectively). The childbirth rates range from 1.27% in Slovenia to 8.52% in Latvia. The childbirth rate is also relatively low in Sweden, Estonia, Norway, and Croatia (lower than 2.5%), while it is relatively high in Spain, Hungary, the Netherlands, and the Czech Republic (between 6% and 7.5%).

[Place Table 1 here]

The relationship between the indicators for poverty and childbirth by country is displayed in Figure 1. The sign of the relation, as is clear from the differences among countries for both rates (Table 1), is mixed across countries. We note that the overall relation resulting from the line is only slightly positive (rho=0.035), with only eight countries (Croatia, Cyprus, Estonia, France, Ireland, Latvia, and Sweden) out of twenty-five being close to the line. This stimulates the empirical investigation of such a relation.

[Place Figure 1 here]

Table A1 reports summary statistics for the overall sample of households and by childbirth for the variables used in the econometric analysis. The dependent variables used in our investigation are poverty and childbirth. We now briefly describe the covariates included in each equation, keeping in mind that due to the model used, we also include lagged poverty status, lagged childbirth dummies, initial poverty condition, and the average of time-varying covariates (for details, see Section 4).

For the poverty equation, we control for childbirth and for certain characteristics of the head of household, namely age (splitting into age ranges from younger than 25 years to over 64 years), gender, and marital status (civil union or single parent). We also include household characteristics such as the presence of children aged 3 to 15 years of age, the number of disabled and elderly persons (aged 65 or over) in the household, home ownership, and the number of permanent employees, temporary employees, and self-employed.

For the childbirth equation, we control for certain characteristics of females of childbearing age such as age (the overall range of 18 to 50 years is divided into four brackets), education, whether a female is the head of household, as well as her labor market characteristics, such as being employed with a part-time or full-time contract. We consider covariates for household composition as in the poverty equation (number of children, number of disabled persons, number of not disabled elderly persons, home ownership, number of permanent employees, temporary employees, and self-employed). Finally, to account for the role of institutions—and more specifically for country-specific macro-policies that will have had an impact on fertility and employment—as well as for identification purposes, we include two macro-indicators of social protection expenditure: the relative change in public expenditure for children and for social exclusion by country and year, expressed in PPS (Purchasing Power Standard) per head. This is intended to address the risks and needs associated with family and children (Eurostat).[3]

In both equations, we also control for country and time dummies, as we investigate twenty-five countries over the period of 2015–2018.

[3] Figures available from Eurostat at http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do.

4. The econometric approach

We study how childbirth affects individual poverty status using a dynamic bivariate random effects probit model. The relationship between poverty and childbirth may, however, be guided by the existence of feedback effects from poverty to future procreation decisions, i.e., the possibility that shocks in poverty status affect future childbirth. A long-run literature (Malthus 1798; Becker 1992) has debated the influence that income conditions exert on fertility decisions; thus, the importance of shedding light on the existence and direction of feedback effects is twofold. On the one hand, accounting for potential feedback from poverty to future childbirth enables us to relax the strict exogeneity assumption, which avoids the estimates of state dependence and other parameters of interest being biased. On the other hand, it allows us to explicitly model childbearing decisions and uncover the role of income conditions for childbirth.

Following Biewen (2009), we model both the poverty and childbirth processes and estimate a first-order Markov chain random effects bivariate probit model that endogenizes childbirth. The model has a recursive structure, implying that the two equations are not simultaneous, i.e., the poverty equation includes current childbirth status but the childbirth equation only includes lagged poverty condition. Biewen (2009) has stressed that simultaneous systems of qualitative outcomes are non-logically consistent.

Let us define p_{ict} as the individual poverty status of individual $i = 1 \ldots n$ at time $t = 1 \ldots T$ for country $c = 1 \ldots C$. We assume that poverty status is described by the following benchmark model:

$$p_{ict} = 1\{\gamma p_{ict-1} + \beta b_{ict} + \delta b_{ict-1} + \omega x_{ict} + \varphi z_{ic} + a_{ic} + u_{ict} > 0\}, \qquad (1)$$

where p_{ict-1} is the lagged poverty status, b_{ict} is a dummy variable indicating whether a child was born in the household in the current or previous year or not, b_{ict-1} is the lagged childbirth dummy variable, while x_{ict} and z_{ic} are vectors of strictly exogenous time-variant and time-invariant (respectively) individual and household characteristics. γ is the state dependence parameter and β is the parameter of interest describing the impact of childbirth on poverty, while δ, ω, and φ are sets of parameters to be estimated. Finally, a_{ic} and u_{ict} represent the unobserved time-invariant individual effect and the idiosyncratic error term; we assume that these are both normally distributed and that u_{ict} is not serially correlated.[4] We also define an augmented specification for the poverty equation that accounts for interactions between childbirth and lagged poverty dummy variables.[5] This allows us to uncover whether and how childbirth impacts current poverty status conditional on past poverty condition. The augmented equation reads as:

[4] This represents a limitation of our approach but accounting for these would introduce excessive computational burdens (Biewen, 2009).

[5] We also account for heterogeneous effects of childbirth at the country level by defining an alternative specification where the childbirth dummy variable is interacted with a set of country dummy variables.

$$p_{ict} = 1\{\gamma p_{ict-1} + \beta b_{ict} + \chi p_{ict-1} * b_{ict} + \delta b_{ict-1} + \omega x_{ict} + \varphi z_{ic} + a_{ic} + u_{ict} > 0\}. \quad (2)$$

The childbirth equation is common to both specifications and reads as

$$b_{ict} = 1\{\alpha p_{ict-1} + \kappa b_{ict-1} + \tau x_{ict} + \lambda f_{ict} + \psi e_{ct} + g_{ic} + \epsilon_{ict} > 0\}, \quad (3)$$

where f_{ict} is a vector of female-of-childbearing-age variables, e_{ct} is a variable measuring public expenditure on family policies at the country level, while g_{ic} is the random effects term and ϵ_{ict} is an idiosyncratic error we assume to be normally distributed. α, κ, τ, λ, and ψ are parameters to be estimated.

The presence of unobserved heterogeneity must be treated carefully when implementing a dynamic random effects probit model. First, an initial conditions problem arises when the initial values of the outcomes are correlated with the unobserved heterogeneity. We deal with the initial conditions problem by using the approach of Wooldridge (2005), who proposed an alternative conditional maximum likelihood (CML) estimator that considers the distribution conditional on the value in the initial period. Second, the time-invariant unobserved individual effects cannot be considered as standard parameters to be estimated because of the incidental parameters problem (Heckman, 1981). Thus, using the Mundlak method (1978), we relax the assumption that individual-specific random effects are independent of other covariates, and we assume correlated random effects by decomposing the unobserved heterogeneity term into two parts, one correlated and one uncorrelated with time-variant covariates. This framework enables us to net out the correlations between the unobserved random effect and covariates/initial states. However, one must be cautious in interpreting the results as causal effects.

The conditional densities of the unobserved effects are specified via the following auxiliary models:

$$a_{ic} = \theta_0 + \theta_1 p_{ic1} + \theta_2 b_{ic1} + \theta_3 \bar{x}_{ic} + \mu_{ic}, \quad (4)$$

$$g_{ic} = \pi_0 + \pi_1 p_{ic1} + \pi_2 b_{ic1} + \pi_3 \bar{x}_{ic} + \pi_4 \bar{f}_{ic} + \varepsilon_{ic}, \quad (5)$$

where p_{i1} is the initial poverty status, and b_{i1} is the value of the childbirth dummy variable at time 1, while $\bar{x}_i$ and $\bar{f}_i$, are sets of time-averaged time-variant control variables calculated from periods 2 to T and θ_k and π_k are parameters to be estimated.

The Wooldridge approach has been questioned by Akay (2012), who highlighted that the method may produce biased estimates of state dependence in case of short panels. In this regard, Rabe-Hesketh and Skrondal (2013) proposed a solution that consists in including as additional regressors the initial period of time-varying variables, with the aim of reducing the substantial finite sample bias. Therefore, the conditional densities of the unobserved effects are now specified as follows:

$$a'_{ic} = \theta_0 + \theta_1 p_{ic1} + \theta_2 b_{ic1} + \theta_3 \bar{x}_{ic} + \theta_4 x_{ic1} + \mu_{ic}, \tag{6}$$

$$g'_{ic} = \pi_0 + \pi_1 p_{ic1} + \pi_2 b_{ic1} + \pi_3 \bar{x}_{ic} + \pi_4 \bar{f}_{ic} + \pi_5 \bar{x}_{ic1} + \pi_6 f_{ic1} + \varepsilon_{ic}. \tag{7}$$

The model we implement allows random effects terms and residuals to be correlated according to a bivariate normal distribution with zero mean and σ^2_{ic} variance. Therefore, we also estimate the respective correlation terms: $\rho_U = (u_{ic}, \varepsilon_{ic})$ and $\rho_E = (u_{ict}, \epsilon_{ict})$.

Wooldridge's approach and related extensions allow easily handling attrition and reduce problems associated with the use of richer but unbalanced sets of data by allowing attrition to vary across initial poverty status; in particular, individuals with different initial levels of poverty are allowed to have distinct missing data probabilities.

As suggested by Biewen (2009), thanks the recursive structure of the model, its identification may be pursued without imposing exclusion restrictions. Nevertheless, because the childbirth equation includes additional covariates (e.g., female of childbearing age, education, and public expenditure for family policies) with respect to the poverty equation, this provides supplementary variation for the identification of the relationship between poverty and childbirth (e.g., Biewen, 2009; Picchio and van Ours, 2013).

Finally, because the estimated coefficients describe the sign of the relationship but are inappropriate for determining the magnitude of the impact between outcome and explanatory variables, we compute and report average marginal effects (AMEs).

5. Empirical Results

Our empirical results are presented in Tables 3 to 6 (and Tables A1–A3 in the Appendix). All tables report the computed average marginal effects (AMEs), which facilitate the interpretation of estimation results by defining the absolute impact of a change in an explanatory variable on the risk of poverty. The section is structured into four sub-paragraphs. The first presents results related to the poverty equation, using both specification 1 and specification 2. The second focuses on the childbirth equation, while the third briefly presents results related to possible non-linearity in the childbirth–income relationship. Finally, the fourth sub-paragraph considers effects at the country level, both in the poverty and the childbirth equation.

5.1. Poverty equation

Table 2 focuses on our main estimates, which are related to the relationship between childbirth and poverty and the estimate of poverty state dependence. Table 2 reports results from both the benchmark specification (equation 1) and the augmented specification (equation 2), which adds the interaction between childbirth and lagged poverty with respect to the benchmark specification. In addition, it shows results from both methods adopted, namely those of Wooldridge (2005; W model) and Rabe-Hesketh and Skrondal (2013; RHS model). The advantage of using the W and RHS methods is that they both allow endogenous initial conditions and correlated random effects. In addition, they allow relaxing the strict exogeneity assumption of childbirth in the main equation, thus accounting for feedback effects. Therefore, the empirical approach allows us to obtain consistent estimates of state dependence. The distinction between poverty state dependence due to individual heterogeneity and the causal relationship between current and future poverty status (genuine state dependence) is crucial for designing effective poverty-contrasting policies and to obtain consistent estimations of the impact of childbirth on poverty.

The first row of Table 2 reports estimates of genuine state dependence. As expected, the AME for lagged poverty status is positive and highly significant, thus demonstrating the existence of genuine state dependence of poverty in Europe. Looking at the benchmark specification, the AME is +7.7 percentage points (pp) according to the W model and +8.3 pp according to the RHS model. When considering the augmented specification, the estimated AMEs of lagged poverty increase to +7.9 pp and +8.1 pp, respectively. Bosco and Poggi (2020), using information from a previous (2008–2011) EU-SILC wave for 26 countries, found that genuine state dependence in Europe was about +6 pp, possibly indicating that persistence in poverty status has increased over the last decade. Evidence emerging from the same stream of literature (e.g., Biewen, 2009; Devicienti and Poggi, 2011; Ayllon, 2015; Giarda and Moroni, 2018) confirm the presence of genuine state dependence in Europe, the magnitude of which may vary at the country level.

With the aim of gaining an in-depth understanding the role of past poverty experience on current poverty status, we comment on the results related to the initial poverty status (second row).[6] The estimated AMEs are +13.8 pp according to the W model and +11.9 pp according to the RHS model, for both the benchmark and the augmented specifications. This suggests that on average, European individuals experience an increasing difficulty in escaping poverty because of discouraging factors (e.g. loss of motivation, depreciation of human capital or unfavorable general attitudes) induced by the experience of poverty itself increases over time. This finding matches the results of Bosco and Poggi (2020). Moreover, Biewen (2009) and Ayllòn (2015) show that the evolution of the mentioned discouraging factors induced by the experience of poverty may vary at the country level.

[6] In line with Ayllòn (2015), we jointly consider the estimates of past and initial poverty to shed light on the evolution of factors reducing the probability to escape poverty.

The third row reports how childbirth affects the risk of poverty. Looking at the benchmark specification, the AME is positive and statistically significant but relatively small in magnitude. According to the W model, in fact, childbirth increases the probability of being poor by 2 pp, while the value is +1.6 pp according to the RHS model.

The positive impact we find matches the explanation by which childbirth reduces equivalent disposable income, and the possible compensatory effect due to child-related public transfers is, on average, unable to countervail the income loss. So, the increase in the risk of poverty may be directly explained by the increase in equivalent adults in the household because of the newborn. In addition, it has been shown that childbirth leads to a decrease in household labor supply, especially through the reduction of working hours or even the exit of mothers from the labor market. This relationship may vary across countries, however, because of the labor market and family policies (e.g., Del Boca et al., 2005; Michaud and Tatsiramos, 2011; Herrarte et al., 2012). The persistence of discouraging factors induced by the experience of poverty may be linked to mothers' labor supply response to maternity. The strong negative employment shock due to childbirth, in fact, is only partly absorbed over time and employment loss largely persists in the long run (Fitzeberger et al., 2013).

The fifth and sixth rows of Table 2 report estimates for past childbirth indicators. Their inclusion in the model specifications allows controlling for persistent effects of past childbirth. The estimated AMEs, however, are small and strongly not statistically significant, possibly because a large portion of the impact of past childbirth is absorbed by the dummy variable controlling for the presence of children aged 3–15.

[Place Table 2 here]

Interestingly, the augmented specification (specification 2 in Table 2) enables us to decompose the childbirth effect on poverty conditional on past poverty status. The third row (seventh and tenth columns) of Table 2 shows the impact of childbirth on poverty for individuals out of poverty in the previous period, while the fourth row (seventh and tenth columns) reports the impact for those in poverty in the previous period. Our estimates reveal that childbirth increases the risk of poverty of non-poor individuals at time *t–1* (by 2.7 pp according to the W model and by 2.3 pp according to the RHS model). This finding is quite consistent with results obtained by Barbieri and Bozzon (2016), who find that childbirth increases the probability of entering poverty in some European regions and for specific family types. They find that childbirth is poverty-inducing in Southern Europe—especially for households with a weaker attachment to the labor market—and in all European regions for households with a single parent, while the impact is close to zero for other subgroups. Looking at the fourth row of Table 2, we highlight a negative association between childbirth and the risk of poverty for individuals who were poor in the previous period (–1.8 pp according to the W model and –2.1 pp according to the RHS model). This finding may be indicative that family policies, and especially income support for childbirth, are quite effective in sustaining low-income households in the presence of newborns. Social benefits, including child benefits and maternity support, in fact, are usually targeted to low-income families and thus may play a redistributive role.

The importance of the welfare system is noted in a supplementary analysis, the results of which are displayed in Table 3. We run the augmented specification (W model) on two groups of countries defined according to the level of public expenditure on family/child policies, expressed in PPS per head. More specifically, we distinguish between countries in which public expenditure on family/child policies are above the median of the related distribution and those that in which it falls below the median. We find that childbirth increases the risk of poverty of non-poor individuals at time *t–1* quite homogenously across the groups considered (+3.8 pp for countries above the median and +3.5 pp for those below the median). Interestingly, childbirth decreases the risk of poverty for individuals who were poor in the previous period, but the effect diverges according to the level of public expenditure on family/child policies. The reduction is smaller (–1 pp) and not statistically significant for countries in which public expenditure on family/child policies is below the median, while it is –2.3 pp for countries with higher levels of public expenditure. This finding stresses the importance of public measures to support both childbirth and reduce the risk of poverty persistence after childbirth.

[Place Table 3 here]

Table 4 reports AMEs of control variables for both the W and RHS models of the benchmark specification. Individual controls are settled at the level of the head of the household (HH). Estimates are similar across models and specifications; thus, for the sake of brevity, we prevalently focus on results from the W model. Looking at individual characteristics, the control for HH age reveals that when the HH is over 64 the risk of poverty is higher by 4.8 pp with respect to the baseline category (HH aged less than 25 years), while no significant differences emerge for other age subgroups. Having a female HH slightly increases the risk of poverty by 0.9 pp (according to the RHS model), while educational levels play a more relevant role. With low-educated HH being the baseline category, having a middle-educated HH decreases the risk of poverty by 3.2 pp while having a highly educated HH reduces the risk of poverty by 7.9 pp. This finding is standard and is related to the positive association between higher educational levels and better economic conditions. Finally, the presence of a married HH decreases the risk of poverty by 2.5 pp Looking at the household characteristics, we find that singles experience a lower risk of poverty (–0.9 pp), while the presence of children aged 3–15 and persons with disabilities each increase the risk of poverty by 1.3 pp. This finding suggests that on average, family policies are insufficient to ensure adequate help for families with dependent members. The risk of poverty increases with the number of persons with a disability (+ 1.4 pp). In contrast, the presence of elderly persons—as expected—slightly reduces the risk of poverty (–0.3 pp), but the estimate is not statistically significant. Being a homeowner decreases the risk of poverty by 2.9 pp, indicating the relevance of one's housing situation for avoiding a low-income condition. We also control for the role of employment conditions at the household level by controlling for the number of permanent, temporary, and self-employed workers in the household. Our results show that the risk of poverty is negatively associated with the number of employed persons. The number of permanently employed reduces the risk of poverty by 5.5 pp, while the impact is –3.8 pp in the case of temporary employment and –2.1 pp for the self-employed. This finding highlights the relevance of employment status in determining poverty status, and especially demonstrates the role of permanent employment in ensuring more stable and higher earnings, thus avoiding low-income conditions. Finally, we control for the role of public expenditure on family/child policies and social exclusion measures and find that they are both effective in reducing the risk of poverty.

[Place Table 4 here]

5.2. Childbirth equation

Table 5 reports the AMEs for the childbirth equation common to both the benchmark and augmented specification of the poverty equation following the W (columns 1 and 2) and RHS model (columns 3 and 4). Based on the W and RHS frameworks and following Biewen (2009), we modeled how childbirth affects individual poverty status by using a dynamic random effects probit model that explicitly allows for feedback effects from past poverty to future childbirth perspectives (see Section 4). The top panel of Table 5 shows the estimates for feedback effects and initial conditions. In general, we note similar AMEs (both in magnitude and sign) for both of the models used. The results suggest that experiencing poverty increases childbirth probabilities in future periods, therefore indicating the existence of feedback effects as well as the state dependence effects of childbirth. From Table 5, we note that the association between lagged poverty and childbirth is positive and significant. While the correlation between lagged poverty and childbirth is small in absolute terms (+0.9 pp for the W model and +1 pp for the RHS model), past childbirth increases childbirth prospects by +6.4 pp in both the W and RHS models. The initial conditions are negative and significant, but their magnitude is low (–0.5 pp for poverty in both models and –1.0 pp and –0.9 pp for childbirth in the W model and the RHS model, respectively). In other words, experiencing poverty or childbirth in the initial period reduces the probability of future procreation.

In general, the effects of the other variables on childbirth are in line with prior expectations. We control for individual characteristics of females of childbearing age, household characteristics, and macroeconomic indicators. In the middle panel of Table 5, we report the estimates for individual characteristics. We note that the age of females is negatively associated with childbirth. The AMEs from the two models are similar.

For education, we distinguish among three categories, taking as a reference primary or low-educated females. Our estimations show an interesting result, as women with higher levels of education appear to be more likely to have a child compared to low-educated women.[7] Although this finding might contrast the traditional inverse relationship between

[7] We further investigate the relationship between fertility and poverty after regressing out the effects of education. In a first stage, we estimate generalized linear models for our main dependent variables (poverty and childbirth). In a second stage, we employ the residuals for the main estimations for which we have used linear dynamic panel-data estimation

education and childbirth, it points in the same direction as the empirical evidence that claims that this relationship has become positive in several countries over the last decade (see, for instance, Herrarte et al., 2012). However, the estimated AMEs are small in magnitude for both categories of education (–0.2 pp for low-educated females of childbearing age and +0.8 pp for highly educated females of childbearing age).

From Table 5, we note that a female head of household is associated with a lower probability of childbirth. We control for labor market conditions of females as this is interrelated with childbirth (Barbieri and Bozzon, 2016). We are able to distinguish between part-time and full-time employees. Being employed—especially with a part-time contract—reduces the probability of childbirth compared to being unemployed or inactive, by –1.9 and –2 pp, respectively. Marriage is positively associated with childbirth, increasing the probability of procreation by 0.8 pp and 1.0 pp in the W and RHS specifications, respectively (Herrarte et al., 2012).

As for household characteristics, the presence of children aged 3 to 15 years increases the likelihood of childbirth, (+0.2 pp for the W model and +0.3 pp for the RHS model), while the presence of either household members with disabilities or abled elderly persons does not exert an important role. Home property is positively associated with childbearing.

As explained in Section 3, we are able to control for the different labor market statuses of household members of females of childbearing age, namely the presence of permanent workers, temporary workers, and the self-employed other than females of childbearing age. Notably, these labor market statuses have a different association with the likelihood of childbirth for cohabiting females of childbearing age. The number of permanent workers increases the likelihood of childbirth (by 0.4 pp in both models). For temporary workers, the AME is +0.3 pp for the W model and +0.4 pp for the RHS model, and for the self-employed it is +0.2 pp for the W model and +0.3 for the RHS model.

For macroeconomic indicators, we control for both the relative change in public expenditure on family/child policies and social exclusion at the country level, and these are both positively associated with childbirth. In particular, this finding indicates the efficacy of investment in family policies for enhancing childbirth prospects.

Taken together, the results provide evidence that childbirth experiences as well as past poverty may increase the probability of childbirth in the future (despite a relatively low magnitude). We also suggest the importance of the labor market status both of females of childbearing age and their household members, as well as the role of stable family unions (positive role of marriage and negative role of female heads of household). The presence of disabled persons, representing a potential additional burden for females of childbearing age, as well the presence of elderly persons, which instead might be a source of free care, does not affect the probability of procreation. Finally, our results also suggest that the social

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(Blundell and Bond, 1998). The positive association between fertility and poverty is confirmed. For the sake of brevity, we do not report the results here, but they are available upon request.

policies able to provide income support, for example, in the form of child and family allowances, as well as those offering greater opportunities to reconcile family duties and work might be crucial for future childbirth prospects.

[Place Table 5 here]

5.3 Non-linearity in the childbirth–income relationship

This section investigates the possibility of non-linearity in the childbirth–income relationship. To this aim, we split non-poor individuals between those belonging to the middle class and wealthy individuals. The latter group is identified as those having an equivalent income higher than 150% of the median national equivalent income, while the former includes individuals with an equivalent income greater than 60% of the median national equivalent income but lower than 150%. This division returns a quite symmetric distribution of individuals as the poorest group includes 16.5% of all individuals, the richest one includes 18.5% of all individuals, and the middle class includes 65% of all individuals. Table A2 reports estimates related to the poverty equation. Accordingly, we note that childbirth decreases the probability of belonging to the middle class (–5.6 pp), while it increases the probability of being wealthy (+2.6 pp).[8] This result may indicate that richer individuals increase their economic resources after childbirth, both to face new income needs and to improve the household endowments and provide children with better opportunities in the future. A possible mechanism is that richer households increase their labor supply after childbirth—a hypothesis compatible with the greater possibility of accessing formal care because they are not liquidity-constrained.

Table A3 refers to the childbirth equation. The relationship between childbirth and past income conditions displays a weak U-shaped pattern. As noted in the main analysis, being poor in the previous period increases by 0.9 pp the probability of having a newborn. Being in the middle class in the previous period instead decreases childbirth by 0.5 pp, while being wealthy at time t–1 increases the probability of having a newborn by 0.4 pp, but the estimate is not statistically significant.[9]

5.4 Heterogeneous effects at the country level

With the aim of uncovering heterogeneous effects at the country level, we modify the benchmark specification by including two sets of interaction dummy variables. In the poverty equation, we interact the childbirth dummy variable with a set of country dummy variables, while in the childbirth equation we interact the lagged poverty dummy variable

[8] It should be noted that when expanding the share of wealthier individuals, the positive effect of childbirth tends to disappear. For example, when considering the wealthier 50% the impact is negative and not statistically significant (relevant tables are available upon request), thus suggesting that the positive relationship between childbirth and wealthier individuals is at work for relatively high incomes.

[9] The childbirth–income relationship perhaps deserves deeper analysis to better understand the mechanisms at work, which we leave for a future study.

with a set of country dummy variables. Estimates are obtained by using the Wooldridge model (Table 6), while estimates from the Rabe-Hesketh and Skrondal method are not available due to the computational burden. Figure A2 summarizes the evidence for interacted terms for both equations. Columns 1 to 4 refer to the poverty equation and display the association between childbirth and poverty at the country level. Thus, the country dummy variable identifies, country by country, the effect on the risk of poverty in the absence of newborns, while the interacted dummy variable identifies (again country by country) the net effect on the risk of poverty due to childbirth.[10] The base category is represented by Austria. When considering the impact on the risk of poverty in the case of households without newborns, it emerges that the countries for which the risk of poverty is lower than Austria are the Nordic countries and the Netherlands. In particular, being Finnish reduces the risk of poverty by 5.2 pp, while Norwegians see their risk of poverty reduced by 1.2 pp. The impacts for other Nordic countries fall in that range. Among Eastern, Southern, and Western European countries, the risk of poverty is generally higher than in Austria. In particular, Baltic countries show the greatest increase with respect to the base category (Estonia +5.2 pp and Lithuania +6 pp).

Our results suggest that countries generally perform quite homogeneously within regions. The emerging picture is in line with the traditional structure of economic poverty and income inequality, i.e., more equal distribution of resources in Nordic countries and more inequality in Southern and, especially, Eastern Europe, while Western countries display intermediate positions, with few exceptions. This confirms the possibility of analyzing poverty and income inequality in Europe at the regional level. However, the mentioned homogeneity tends to weaken when focusing on the role of childbirth, bringing out a more fragmented picture.[11] In some Eastern countries, childbirth is associated with a decrease in the risk of poverty. The negative association ranges between –8.5 pp for Estonia and –6.5 pp for Hungary. Croatia and Latvia display an intermediate position. In contrast, childbirth increases the risk of poverty in Serbia (+2.1 pp). Mixed effects within regions also emerge in Southern and Western Europe. Among Mediterranean countries, the correlation between childbirth and the risk of poverty is negative in Spain (–6 pp) and positive in other countries (up to 5.7 pp in Cyprus), although it is not significant in other countries. Among Western countries, childbirth strongly reduces the risk of poverty in Switzerland (–14.6 pp), while the association is positive in other countries (e.g., up to 6.5 pp in Belgium). Finally, the association is positive in all Nordic countries. The magnitude is highly variable, however, being +0.9 pp in Norway (but not statistically significant) and +17.5 pp in Sweden. The evidence emerging from Northern Europe is a bit counterintuitive. Northern countries are usually characterized by higher expenditure on social and family policies, including support for children and maternity; however, Nordic countries have experienced an increase in poverty

[10] Figure A2 (in the Appendix) offers a visual inspection of both the impact of childbirth on the risk of poverty and the impact of lagged poverty on childbirth at the country level.

[11] The impact of childbirth cannot be estimated for three countries, namely Austria, Finland, and Romania, because of few available observations.

rates over the last decade. In addition, Barbieri and Bozzon (2016) showed that childbirth increases the risk of poverty at least for single parents, who are common in North Europe.

Although our results are somehow compatible with the recent trends of poverty in Europe, we do not consider them to be definitive. A potential shortcoming associated with the estimation of the impact of childbirth at the country level using a unique specification based on the whole sample and accounting for country effects by interaction dummy variables implicitly denies the possibility of investigating the role of the variability of control variables at the country level. Unfortunately, estimating the impact of childbirth country by country is difficult because of the complexity of the adopted methods and the few observations for childbirth at the country level. Our results, however, seem to suggest that the impact of childbirth on poverty shows some heterogeneities within regions. This aspect deserves further attention in future work.

Focusing on the childbirth equation, we note that the AMEs of country dummy variables (which indicate the impact on childbirth for non-poor individuals) are rarely significant in the statistical sense, suggesting a quite homogeneous pattern across European countries for this sub-group of individuals. When significant (Spain, Ireland, Malta, and Serbia), the related AMEs are positive. Looking at the interacted terms, we find that when significant the impact of past poverty on childbirth is generally positive, with the only exception of Cyprus (–1.3 pp). This confirms the finding that emerged at the European level. The positive magnitude shows some heterogeneity across countries, however. The highest AMEs are found for Belgium (+2.8 pp) and Hungary (+2.7 pp), while the lowest (significant) AME is found for Spain (+1.1 pp).

[Place Table 6 here]

Conclusions

In this paper, we offer novel evidence on the relation between childbirth and poverty in 25 EU countries by using EU-SILC panel data over the period of 2015–2018. We estimate dynamic bivariate probit models, which relax the assumption of exogeneity of childbirth and allow for the presence of feedback effects from poverty to childbirth. Our frameworks account for state dependence, unobserved heterogeneity, and endogenous initial conditions, and this enables us to decompose poverty persistence into genuine state dependence and observable and unobservable factors.

Our results suggest the existence of genuine poverty state dependence in Europe. As for the initial poverty status, we note that on average, European individuals experience increasing difficulty in escaping poverty. Overall, childbirth is positively associated with poverty, although the magnitude of the relation is relatively small. When disentangling this effect at the country level (in our additional estimation exercise), we find that the association between childbirth and poverty is essentially positive in Western European countries and negative in the Eastern ones. The average positive impact we find matches the explanation for which childbirth reduces equivalent disposable income, and the possible compensatory effect due to child-related public transfers seems unable to countervail the income loss.

From our augmented specification, we note that childbirth reduces the risk of poverty for households that were poor in the previous period. This indicates that social benefits supporting childbirth and maternity are effective in shifting low-income households out of poverty in the presence of newborns, suggesting a potential redistributive role of childbirth-related policies. A supplementary analysis clarifies that the redistributive effects are stronger in countries with higher levels of public expenditure on family/child policies, stressing the role of public measures to support both childbearing decisions and to reduce the risk of poverty persistence after childbirth.

Our findings for the household characteristics considered offer additional interesting insights. On the one hand, we find that being in a single-parent household and the presence of other children, as well as that of disabled household members, are positively associated with the risk of poverty. On the other hand, we note that poverty is negatively associated with the education of heads of household, the stability of her/his employment status, as well as the presence of elderly persons in the household. This highlights the role of education and the (associated) employment stability of household members in combatting poverty, as well as the possible importance of elderly pensions.

From our childbirth equation, we note the presence of feedback effects from poverty to childbirth and vice versa, and this suggests that experiencing poverty increases childbirth probabilities in future periods. When accounted for, we find some traces of a possible U-shaped relationship between past income and childbearing decisions. Furthermore, we find a role for investment in social policies regarding (current) childbirth.

From our results, we can derive some hints for policymakers. The nature of poverty state dependence and the importance of initial poverty status suggest that correctly designed poverty-contrasting policies might exert an effect in future. Furthermore, targeting policy interventions to specific household categories, for instance to single-parent households, households with disabled members, low-educated households, and those with members experiencing precarious employment conditions, is essential to obtain persistent results both for poverty reduction and to sustain childbirth in the future. The efficacy of family social policies is supported by our results regarding current childbirth. The addition of social policy measures able to provide income support—for example, in the form of child and family allowances—and opportunities to reconcile family duties and work, as well as the extension of the duration of such measures, might be crucial for future childbirth prospects as well.

References

Akay, A., “Finite-Sample Comparison of Alternative Methods for Estimating Dynamic Panel Data Models,” *Journal Applied Econometrics*, 27, 1189-1204, 2012.

Ayllón, S., “Understanding Poverty Persistence in Spain,” *SERIEs. Journal of Spanish Economic Association*, 42, 201–233, 2013.

Ayllón, S., “Youth Poverty, Employment and Leaving the Parental Home in Europe,” *Review of Income and Wealth*, 61, 651-676, 2015.

Ayllón, S. and A. Gàbos, “The Interrelationships between the Europe 2020 Poverty and Social Exclusion Indicators,” *Social Indicators Research*, 130, 1025-1049, 2017.

Barbieri, P. and R. Bozzon, “Welfare, Labour Market Deregulation and Households’ Poverty Risks: An Analysis of the Risk of Entering Poverty at Childbirth in Different European Welfare Clusters,” *Journal of European Social Policy*, 26, 99–123, 2016.

Barbieri, P. and G. Cutuli, “A Uguale Lavoro, Paghe Diverse; Differenziali Salariali e Lavoro a Termine nel Mercato del Lavoro Italiano,” *Stato e Mercato*, 4, 471–504, 2010.

Bàrcena-Martìn, E., M.C. Blanco-Arana, and S. Pérez-Moreno, “Dynamics of Child Poverty in the European Countries,” Working Papers No. 437, ECINEQ, Society for the Study of Economic Inequality, 2017.

Becker, G.S., “Fertility and the Economy,” *Journal of Population Economics*, 5, 185-201, 1992.

Biewen, M., “Measuring State Dependence in Individual Poverty Histories when there is Feedback to Employment Status and Household Composition,” *Journal of Applied Econometrics*, 24, 1095–116, 2009.

Birdsall, N., A.C. Kelley, and S.W. Sinding, *Population Matters: Demographic Change, Economic Growth, and Poverty in the Developing World*. Oxford University Press, Oxford, 2001.

Blundell, R. and S. Bond, “Initial Conditions and Moment Restrictions in Dynamic Panel Data Models,” *Journal of Econometrics*, 87, 115–143, 1998.

Bosco, B. and A. Poggi, “Middle Class, Government Effectiveness and Poverty in the EU: A Dynamic Multilevel Analysis,” *Review of Income and Wealth*, 66, 94–125, 2020.

Cantillon, B., “The Paradox of the Social Investment State: Growth, Employment and Poverty in the Lisbon Era,” *Journal of European Social Policy*, 21, 432–449, 2011.

Cantillon, B., Goedemé, T., and J. Hills, *Decent incomes for all: improving policies in Europe. International policy exchange series*, New York, Oxford University Press, 2019.

Cappellari, L. and S.P. Jenkins, “Modelling Low Income Transitions,” *Journal of Applied Econometrics*, 19, 593–610, 2004.

Clark, G. and G. Hamilton, “Survival of the Richest. The Malthusian Mechanism in Pre-Industrial England,” *Journal of Economic History*, 66, 707–736, 2006.

Clark, G. and N. Cummins, “Urbanization, Mortality, and Fertility in Malthusian England,” *American Economic Review*, 99, 242–247, 2009.

Clark, G. and N. Cummins, “Malthus to Modernity: Wealth, Status, and Fertility in England, 1500–1879,” *Journal of Population Economics*, 28, 3–29, 2015

Del Boca, D., Pasqua, S. and C. Pronzato, “Fertility and Employment in Italy, France, and the UK,” *LABOUR*, 19, 51–77, 2005.

Devicienti, F. and A. Poggi, “Poverty and Social Exclusion: Two Sides of the same Coin or Dynamically Interrelated Processes?,” *Applied Economics*, 43, 3549–3571, 2011.

Fitzenberger, B., Sommerfeld, K. and S. Steffes, “Causal Effects on Employment after First Birth: A Dynamic Treatment Approach,” *Labour Economics*, 25, 49–62, 2013.

Fouarge, D. and R. Layte, “Welfare Regimes and Poverty Dynamics: The Duration and Recurrence of Poverty Spells in Europe,” *Journal of Social Policy*, 34, 407–426, 2005.

Giarda, E., and G. Moroni, “The Degree of Poverty Persistence and the Role of Regional Disparities in Italy in Comparison with France, Spain and the UK,” *Social Indicators Research*, 136, 163–202, 2018.

Gornick, J.C. and M. Jäntti, “Child Poverty in Cross-National Perspective: Lessons from the Luxembourg Income Study,” *Children and Youth Services Review*, 34, 558–68, 2012.

Gradin, N. and O. Cantò, “Why are Child Poverty Rates so Persistently High in Spain,” *Manchester School*, 80, 117–143, 2012.

Heckman, J.J., “The Incidental Parameters Problem and the Problem of Initial Conditions in Estimating a Discrete Time-Discrete Data Stochastic Process,” In Manski C. and D. McFadden (Eds.), *Structural Analysis of Discrete Data with Econometric Applications*, Cambridge: MIT Press, 1981.

Herrarte, A., Moral-Carcedo, J. and F. Saéz, “The Impact of Childbirth on Spanish Women’s Decisions to Leave the Labor Market,” *Review of Economics of the Household*, 10, 441–468, 2012.

Jenkins, S.P., “Perspectives on Poverty in Europe. Following in Tony Atkinson’s Footsteps,” *Italian Economic Journal*, 6, 129–155, 2020.

Jenkins, S.P. and P. Van Kerm, “The Relationship between EU Indicators of Persistent and Current Poverty,” *Social Indicators Research*, 116, 611–638, 2014.

Libois, F. and V. Somville, “Fertility, Household Size and Poverty in Nepal,” *World Development*, 103, 311-322, 2018.

Lucifora, C., McKnight, A. and W. Salverda, “Low-Wage Employment in Europe: A Review of the Evidence,” *Socio-Economic Review*, 3, 259–92, 2005.

Malthus, T.R., *Essay on the principle of population*, Johnson J. Publisher, London, UK, 1798.

McKernan, S.M. and C. Ratcliffe, “Events that Trigger Poverty Entries and Exits,” *Social Science Quarterly,* 86, 1146–69, 2005.

Michaud, P.C. and K. Tatsiramos, “Fertility and Female Employment Dynamics in Europe: The effect of using alternative econometric modeling assumption,” *Journal of Applied Econometrics*, 26, 641–668, 2011.

Moav, O., “Cheap Children and the Persistence of Poverty,” *Economic Journal,* 115, 88–110, 2005.

Mundlak, Y., “On the Pooling of Time-Series and Cross-Section Data,” *Econometrica*, 49, 69–85, 1978.

Picchio, M. and J.C. van Ours, “Retaining through Training even for Older Workers,” *Economics of Education Review,* 32, 29–48, 2013.

Pintelon, O., B. Cantillon, K. van den Bosch, and C. Whelan, “The Social Stratification of Risks: The Relevance of Class for Social Investment Strategies,” *Journal of European Social Policy*, 23, 52–67, 2013.

Rabe-Hesketh S. and A. Skrondal, “Avoiding Biased Versions of Wooldridge's Simple Solution to the Initial Conditions Problem,” *Economics Letters*, 120, 346–349, 2013.

Scherer, S. and R. Grotti, “Accumulation of Employment Instability among Partners. Evidence from Six EU Countries,” *European Sociological Review*, 30, 627–639, 2014.

Stewart, M.B., “The Interrelated Dynamics of Unemployment and Low-Wage Employment,” *Journal of Applied Econometrics*, 22, 511–531, 2007.

Vandecasteele, L., “Life Course Risks or Cumulative Disadvantage? The Structuring Effect of Social Stratification Determinants and Life Course Events on Poverty Transitions in Europe,” *European Sociological Review*, 27, 246–263, 2010.

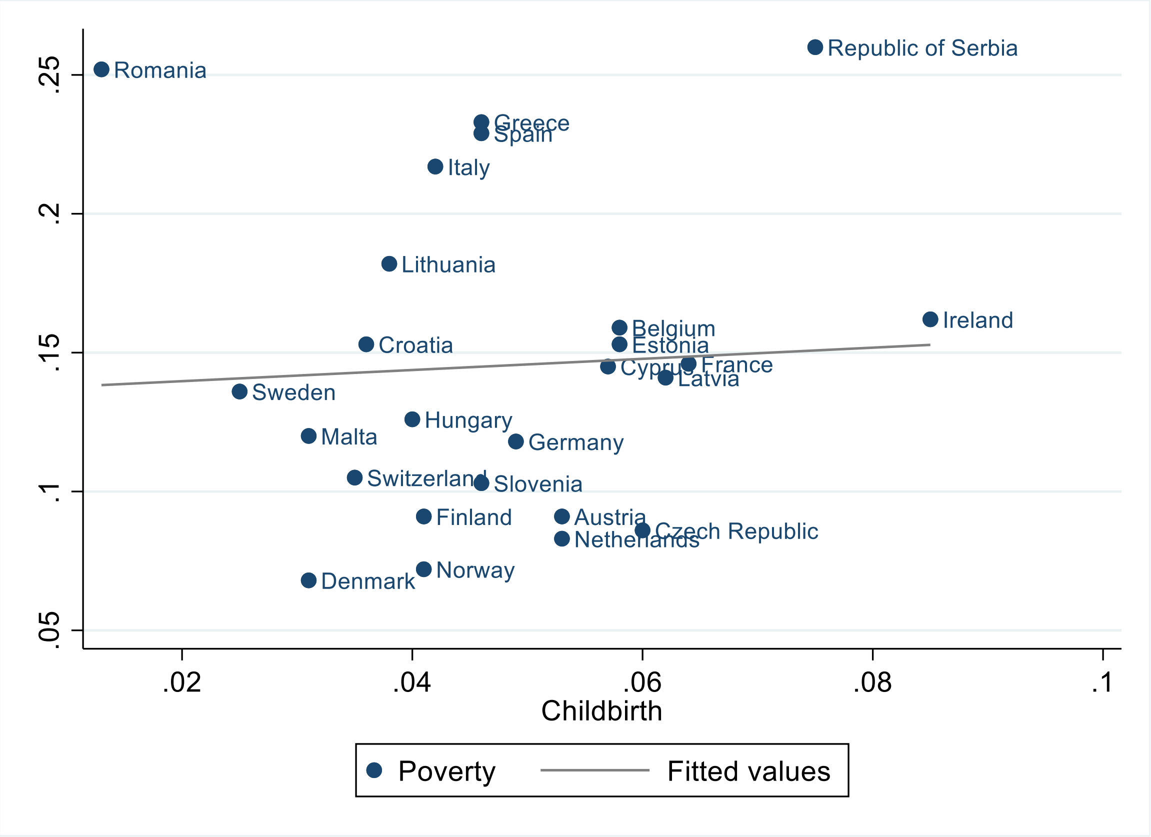
Whelan, C.T., B. Nolan, and B. Maître, “Multidimensional Poverty Measurement in Europe: An Application of the Adjusted Headcount Approach,” *Journal of European Social Policy*, 24, 183–197, 2014.

Wietzke, F.B., “Poverty, Inequality, and Fertility: The Contribution of Demographic Change to Global Poverty Reduction,” *Population and Development Review*, 46, 65–99, 2020.

Wooldridge, J.M., “Simple Solutions to the Initial Conditions Problem in Dynamic, Non-Linear Panel Data Models with Unobserved Heterogeneity,” *Journal of Applied Econometrics*, 20, 39–54, 2005.

Figures and Tables

Figure 1. The relation between poverty and childbirth by country



Source: Authors' calculations from EU-SILC 2015-2018 data

Table 1. Poverty rate, childbirth rate, and observations by country

	Poverty	sd(poverty)	Childbirth	sd(childbirth)	Observations
Austria	9.11	28.80	5.35	22.51	823
Belgium	15.93	36.60	5.78	23.35	4,029
Switzerland	10.51	30.67	3.47	18.30	1,932
Cyprus	14.48	35.19	5.75	23.27	7,065
Czech Republic	8.64	28.09	6.00	23.74	6,805
Germany	11.84	32.31	4.90	21.59	7,897
Denmark	6.78	25.15	3.11	17.36	6,014
Estonia	15.29	35.99	5.84	23.46	11,413
Greece	23.30	42.28	4.61	20.98	12,205
Spain	22.88	42.01	4.64	21.02	14,822
Finland	9.13	28.81	4.09	19.80	2,202
France	14.63	35.34	6.41	24.50	15,903
Croatia	15.34	36.04	3.57	18.55	13,572
Hungary	12.65	33.24	4.02	19.64	12,715
Ireland	16.25	36.90	8.52	27.93	2,382
Italy	21.71	41.23	4.19	20.04	35,364
Lithuania	18.16	38.55	3.83	19.20	5,711
Latvia	14.15	34.85	6.15	24.03	10,371
Malta	12.05	32.56	3.14	17.45	2,449

Netherlands	8.26	27.53	5.30	22.40	19,097
Norway	7.15	25.78	4.09	19.81	3,201
Romania	25.18	43.41	1.27	11.22	5,259
Republic of Serbia	26.03	43.88	7.54	26.41	19,066
Sweden	13.58	34.28	2.47	15.53	810
Slovenia	10.30	30.39	4.57	20.88	9,566
Observations					230,673

Source: Authors' calculations from EU SILC 2015-2018 data.

Table 2. Poverty equation: State dependence and the effect of childbirth

	Specification 1						Specification 2					
	Wooldridge			Rabe-Hesketh & Skrondal			Wooldridge			Rabe-Hesketh & Skrondal		
	AME	s.e.					AME	s.e.				
Poverty time t-1	0.077	0.004	***	0.083	0.002	***	0.079	0.004	***	0.081	0.004	***
Poverty time 1	0.138	0.002	***	0.119	0.002	***	0.138	0.002	***	0.122	0.003	***
Childbirth time t	0.020	0.011	*	0.016	0.004	***	0.027	0.012	**	0.023	0.011	**
Childbirth time t x Poverty time t-1							-0.018	0.006	***	-0.021	0.006	***
Childbirth time t-1	-0.001	0.005		-0.001	0.004		-0.001	0.005		-0.001	0.005	
Childbirth time 1	0.005	0.003		0.001	0.003		0.004	0.003		0.001	0.003	

Source: Source: Authors' calculations from EU-SILC 2015-2018 data. Time and country dummy variables are accounted for. Note: *p < .10, **p < .05, ***p < .01.

Table 3. The impact of childbirth on poverty by level of public expenditure for family/children policies (W model)

	Below the median			Above the median		
	AME	s.e.		AME	s.e.	
Poverty time t-1	0.103	0.006	***	0.049	0.004	***
Poverty time 1	0.160	0.004	***	0.105	0.003	***
Childbirth time t	0.038	0.017	**	0.035	0.015	**
Childbirth time t x Poverty time t-1	-0.010	0.010		-0.023	0.007	***
Childbirth time t-1	0.002	0.008		-0.003	0.005	
Childbirth time 1	0.002	0.005		0.007	0.004	*

Source: Authors' calculations from EU-SILC 2015-2018 data. Time and country dummy variables are accounted for. Full set of covariates are included. Note: *p < .10, **p < .05, ***p < .01.

Table 4. Poverty equation: AME of covariates, specification 1

	Wooldridge			Rabe-Hesketh & Skrondal		
	AME	s.e.		AME	s.e.	
Individual characteristics						
HH age below 25			base-category			
HH age 25–34	0.003	0.005		0.010	0.006	
HH age 35–44	0.003	0.005		0.013	0.006	**
HH age 45–54	-0.002	0.005		0.010	0.007	
HH age 55–64	-0.002	0.006		0.011	0.008	
HH age over 64	0.048	0.007	***	0.064	0.009	***
HH female	0.001	0.002		0.009	0.002	***
HH low educated						
HH middle educated	-0.032	0.002	***	-0.027	0.002	***
HH highly educated	-0.079	0.002	***	-0.071	0.002	***
HH married	-0.025	0.004	***	-0.028	0.005	***
Household characteristics			base-category			
Single	-0.009	0.004	**	-0.008	0.004	**
Presence of children aged 3-15	0.013	0.004	***	0.013	0.005	***
Number of persons with disabilities	0.014	0.002	***	0.011	0.002	***
Number of elderly persons	-0.003	0.006		-0.008	0.008	
Homeowner	-0.029	0.005	***	-0.034	0.006	***
Number of permanent employed persons other than females of childbearing age	-0.055	0.003	***	-0.007	0.002	***
Number of temporary employed persons other than female in childbearing age	-0.038	0.003	***	0.003	0.003	
Number of self-employed persons other than female in childbearing age	-0.021	0.004	***	0.006	0.003	**
Macroeconomic indicators						
Public expenditure for family/children policies	-0.025	0.008	***	-0.020	0.010	**
Public expenditure for social exclusion	-0.020	0.007	***	-0.020	0.008	**

Source: Authors' calculations from EU-SILC 2015-2018 data.

Note: Time and country dummy variables are accounted for. *p < .10, **p < .05, ***p < .01.

Table 5. Childbirth equation: AME, specification 1

	Wooldridge			Rabe-Hesketh & Skrondal		
	AME	s.e.		AME	s.e.	
Poverty time t-1	0.009	0.002	***	0.010	0.002	***
Childbirth time t-1	0.064	0.003	***	0.064	0.003	***
Poverty time 1	-0.005	0.002	**	-0.005	0.002	**
Childbirth time 1	-0.010	0.002	***	-0.009	0.002	***
Individual characteristics						
HH aged less than 25			base-category			
HH aged 25-34	0.014	0.002	***	0.014	0.003	***
HH aged 35-44	0.003	0.002		0.003	0.003	
HH aged 45-54	-0.011	0.003	***	-0.010	0.003	***
HH aged 55-64	-0.003	0.003		-0.002	0.003	
HH aged more than 64	0.006	0.004	*	0.006	0.004	*
Female in childbearing age [18-24]			base-category			
Female in childbearing age [25-34]	-0.009	0.004	**	0.005	0.004	
Female in childbearing age [35-44]	-0.017	0.004	***	0.005	0.005	
Female in childbearing age [45-50]	-0.006	0.005		0.019	0.006	***
HH female	-0.005	0.001	***	-0.006	0.001	***
HH low educated			base-category			
HH middle educated	-0.003	0.001	**	-0.002	0.001	*
HH higly educated	-0.006	0.001	***	-0.005	0.002	***
Female in childbearing age low educated			base-category			
Female in childbearing age middle educated	-0.002	0.001		-0.003	0.001	**
Female in childbearing age highly educated	0.008	0.001	***	0.008	0.001	***
Female in childbearing age part-time employed	-0.019	0.004	***	-0.020	0.004	***
Female in childbearing age full-time employed	-0.012	0.003	***	-0.015	0.004	***
Female in childbearing age married	0.008	0.004	**	0.010	0.004	**
Household characteristics						
Presence of children 3-15	0.002	0.001	*	0.003	0.001	***
Number of persons with disabilities	0.000	0.001		0.001	0.001	
Number of able elderly	-0.003	0.001	*	-0.002	0.002	
Homeowner	0.003	0.001	***	0.003	0.001	***
Number of permanent employed other than females in childbearing age	0.004	0.001	***	0.004	0.001	***
Number of temporary employed other than females in childbearing age	0.003	0.001	***	0.004	0.001	***
Number of self-employed other than females in childbearing age	0.002	0.001	**	0.003	0.001	**

Macroeconomic indicators						
Public expenditure for family/children policies	0.020	0.007	***	0.021	0.007	***
Public expenditure for social exclusion	0.016	0.004	***	0.017	0.004	***

Source: Authors’ calculations from EU-SILC 2015-2018 data.

Note: HH refers to head of household. Time and country dummy variables are accounted for. *p < .10, **p < .05, ***p < .01.

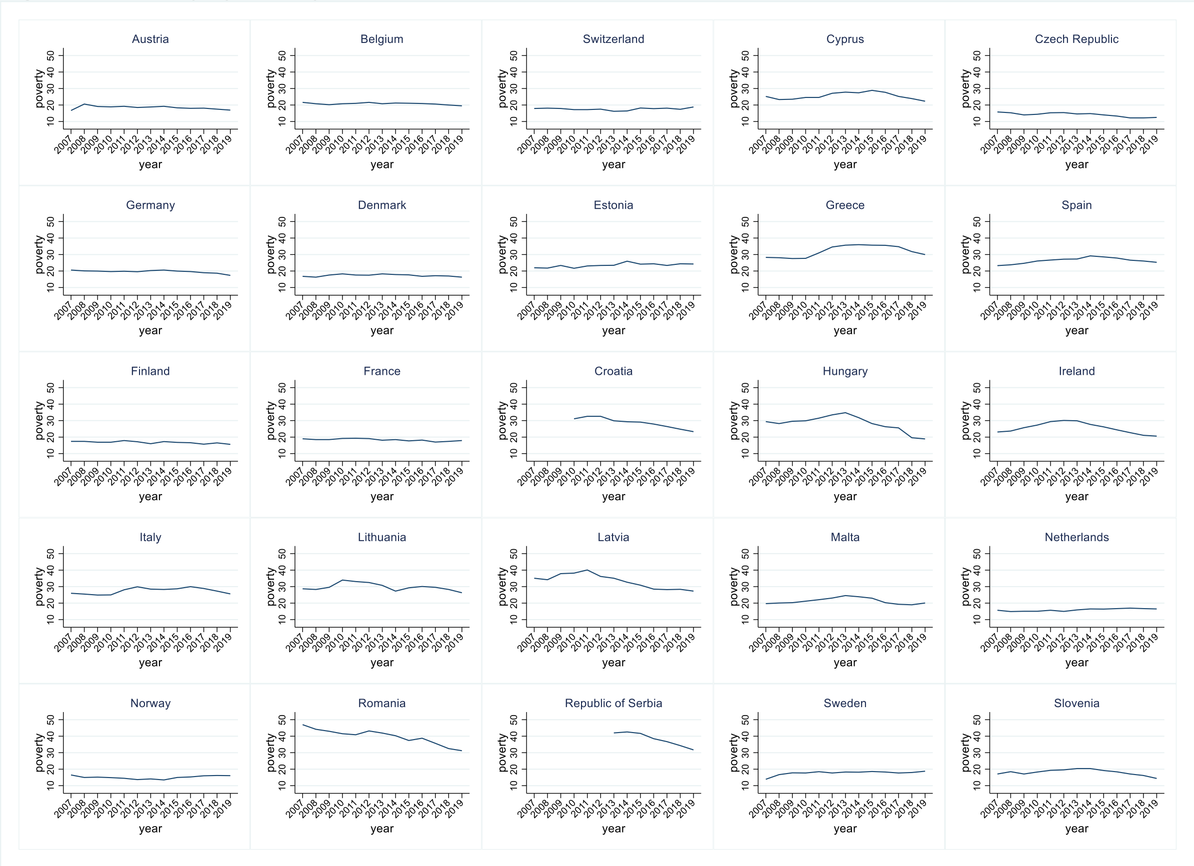
Table 6. Effects by country (W model, specification 1)

Poverty equation				Childbirth equation			
	AME	s.e.			AME	s.e.	
Austria	base-category			Austria	base-category		
Austria*Childbirth				Austria*Lag poor			
Belgium	0.014	0.014		Belgium	0.003	0.008	
Belgium*Childbirth	0.065	0.023	***	Belgium*Lag poor	0.028	0.007	***
Switzerland	0.002	0.015		Switzerland	-0.007	0.009	
Switzerland*Childbirth	-0.146	0.060	**	Switzerland*Lag poor	0.018	0.014	
Cyprus	0.018	0.013		Cyprus	0.010	0.008	
Cyprus*Childbirth	0.057	0.019	***	Cyprus*Lag poor	-0.013	0.006	**
Czech Republic	-0.010	0.014		Czech Republic	0.002	0.008	
Czech Republic*Childbirth	0.001	0.024		Czech Republic*Lag poor	0.022	0.008	***
Germany	0.017	0.013		Germany	0.008	0.008	
Germany*Childbirth	0.007	0.021		Germany*Lag poor	-0.003	0.008	
Denmark	-0.033	0.014	**	Denmark	-0.006	0.008	
Denmark*Childbirth	0.057	0.027	**	Denmark*Lag poor	-0.001	0.011	
Estonia	0.052	0.013	***	Estonia	0.000	0.008	
Estonia*Childbirth	-0.085	0.019	***	Estonia*Lag poor	0.008	0.005	
Greece	0.037	0.014	***	Greece	-0.005	0.008	
Greece*Childbirth	-0.004	0.017		Greece*Lag poor	0.006	0.005	
Spain	0.040	0.013	***	Spain	0.013	0.008	*
Spain*Childbirth	-0.060	0.018	***	Spain*Lag poor	0.011	0.004	***
Finland	-0.052	0.015	***	Finland	-0.011	0.009	
Finland*Childbirth				Finland*Lag poor			
France	0.015	0.013		France	0.002	0.007	
France*Childbirth	0.014	0.015		France*Lag poor	0.019	0.004	***
Croatia	0.037	0.013	***	Croatia	-0.012	0.008	
Croatia*Childbirth	-0.079	0.023	***	Croatia*Lag poor	0.018	0.005	***
Hungary	0.020	0.012	*	Hungary	0.000	0.008	
Hungary*Childbirth	-0.061	0.019	***	Hungary*Lag poor	0.027	0.005	***
Ireland	0.019	0.015		Ireland	0.026	0.008	***
Ireland*Childbirth	0.016	0.025		Ireland*Lag poor	0.022	0.008	***
Italy	0.040	0.013	***	Italy	-0.003	0.007	
Italy*Childbirth	-0.013	0.014		Italy*Lag poor	-0.004	0.004	
Lithuania	0.060	0.013	***	Lithuania	-0.003	0.008	
Lithuania*Childbirth	-0.004	0.025		Lithuania*Lag poor	0.024	0.007	***
Latvia	0.030	0.013	**	Latvia	0.000	0.008	
Latvia*Childbirth	-0.034	0.019	*	Latvia*Lag poor	0.018	0.005	***
Malta	0.015	0.015		Malta	0.033	0.008	***
Malta*Childbirth	-0.028	0.033		Malta*Lag poor	-0.006	0.010	
Netherlands	-0.022	0.013	*	Netherlands	0.005	0.008	
Netherlands*Childbirth	0.007	0.017		Netherlands*Lag poor	0.004	0.006	
Norway	-0.012	0.015		Norway	0.002	0.008	
Norway*Childbirth	0.009	0.034		Norway*Lag poor	-0.031	0.020	
Romania	0.046	0.013	***	Romania	-0.042	0.009	***
Romania*Childbirth				Romania*Lag poor			
Serbia	0.067	0.013	***	Serbia	0.017	0.007	**
Serbia*Childbirth	0.021	0.012	*	Serbia*Lag poor	0.013	0.003	***
Sweden	-0.046	0.019	**	Sweden	0.002	0.012	
Sweden*Childbirth	0.175	0.072	**	Sweden*Lag poor	0.002	0.020	
Slovenia	0.016	0.013		Slovenia	0.006	0.008	
Slovenia*Childbirth	0.030	0.021		Slovenia*Lag poor	0.010	0.006	

Source: Authors' calculations from EU-SILC 2015-2018 data. Time and country dummy variables are accounted for. Full set of covariates are included. Note: *p < .10, **p < .05, ***p < .01.

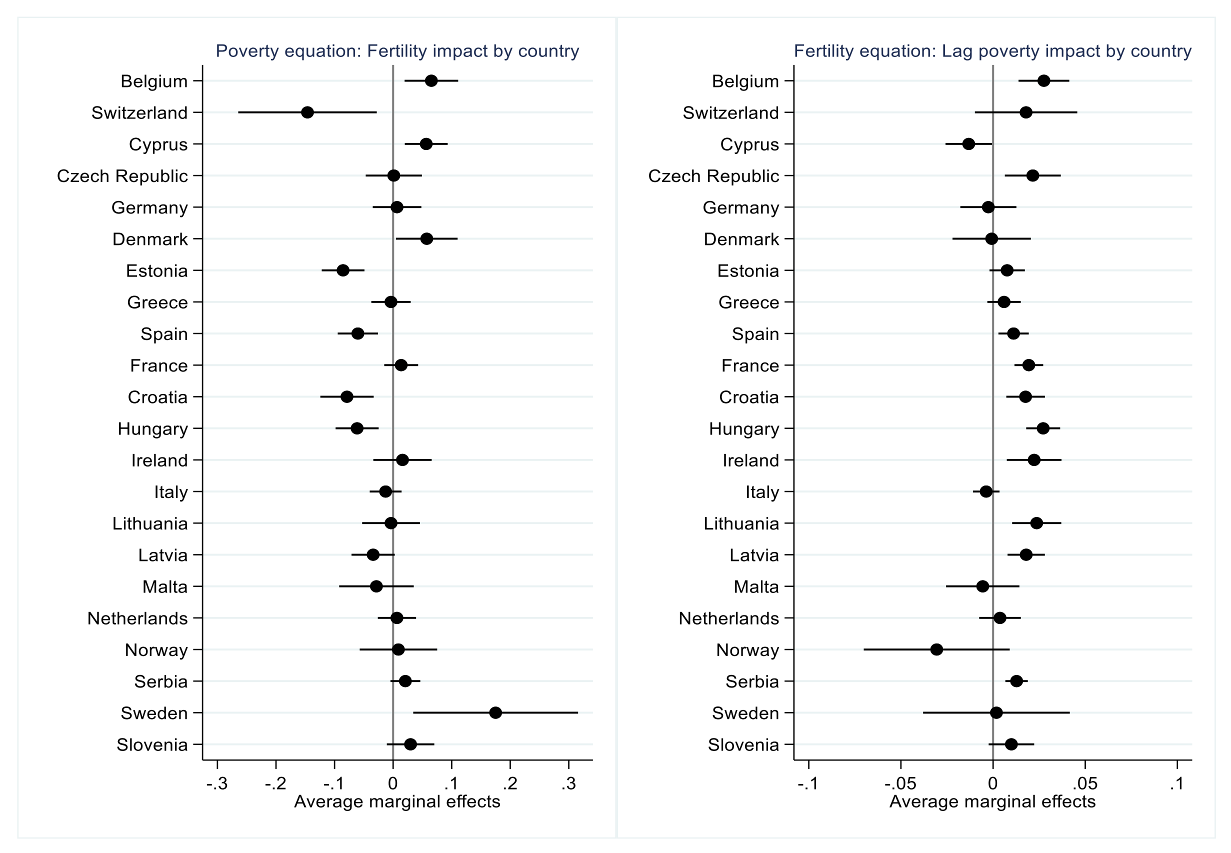
Appendix

Figure A1. Poverty by country, 2007-2019



Source: Authors' calculations from Eurostat data

Figure A2. Effects at country level: interacted terms (W model, specification 1)



Source: Authors' calculations from EU-SILC 2015-2018 data

Table A1. Descriptive statistics	Overall		Childbirth = No		Childbirth = Yes	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Poverty	0.165	0.371	0.164	0.370	0.194	0.395
Childbirth	0.050	0.217				
HH age below 25	0.061	0.240	0.063	0.243	0.031	0.175
HH age 25–34	0.162	0.369	0.150	0.357	0.396	0.489
HH age 35–44	0.329	0.470	0.325	0.468	0.415	0.493
HH age 45–54	0.328	0.470	0.341	0.474	0.092	0.289
HH age 55–64	0.095	0.293	0.097	0.296	0.049	0.215
HH age over 64	0.025	0.157	0.026	0.159	0.016	0.126
HH female	0.425	0.494	0.431	0.495	0.301	0.459
HH low educated	0.200	0.400	0.200	0.400	0.187	0.390
HH middle educated	0.466	0.499	0.467	0.499	0.448	0.497
HH higly educated	0.333	0.471	0.331	0.471	0.365	0.481
HH married	0.761	0.426	0.753	0.431	0.912	0.284
Single	0.038	0.190	0.040	0.195	0.000	0.000
Presence of children aged 3-15	0.550	0.498	0.546	0.498	0.630	0.483
Number of persons with disabilities	0.079	0.301	0.080	0.303	0.055	0.252
Number of elderly persons	0.158	0.454	0.160	0.456	0.112	0.401
Homeowner	0.791	0.406	0.794	0.404	0.741	0.438
Number of permanent employed persons other than females of childbearing age	0.578	0.664	0.575	0.663	0.628	0.689
Number of temporary employed persons other than female in childbearing age	0.092	0.317	0.092	0.317	0.095	0.323
Number of self-employed persons other than female in childbearing age	0.149	0.401	0.149	0.401	0.154	0.392
Female in childbearing age [18-24]	0.110	0.313	0.113	0.316	0.061	0.239
Female in childbearing age [25-34]	0.236	0.424	0.221	0.415	0.526	0.499
Female in childbearing age [35-44]	0.376	0.484	0.377	0.485	0.365	0.482
Female in childbearing age [45-50]	0.251	0.433	0.261	0.439	0.047	0.212
Female in childbearing age low educated	0.257	0.437	0.261	0.439	0.178	0.382
Female in childbearing age middle educated	0.505	0.500	0.508	0.500	0.442	0.497
Female in childbearing age highly educated	0.348	0.476	0.343	0.475	0.431	0.495
Female in childbearing age part-time employed	0.049	0.216	0.049	0.216	0.047	0.211
Female in childbearing age full-time employed	0.162	0.368	0.165	0.371	0.100	0.301
Female in childbearing age married	0.691	0.462	0.679	0.467	0.912	0.284
Number of able elderly persons	0.068	0.294	0.068	0.295	0.056	0.276
Public expenditure on family/child policies (relative change)	0.054	0.096	0.054	0.096	0.065	0.103
Public expenditure on social exclusion (relative change)	0.060	0.181	0.060	0.180	0.073	0.190

Source: Authors' calculations from EU SILC 2015-2018 data.
Note: HH refers to head of household.

Table A2. Non-linear effects in the childbirth-poverty relationship: Poverty equation (W model)

	Yeq <= 60% Median Yeq			60% Median Yeq <Yeq<= 150% Median Yeq			Yeq > 150% Median Yeq		
	Status: Poverty			Status: Average income			Status: Wealth		
	AME	s.e.		AME	s.e.		AME	s.e.	
Status time t-1	0.077	0.004	***	0.150	0.005	***	0.077	0.004	***
Status time 1	0.138	0.002	***	0.283	0.004	***	0.174	0.002	***
Childbirth time t	0.020	0.011	*	-0.056	0.018	***	0.026	0.009	***
Childbirth time t-1	-0.001	0.005		0.021	0.008	***	-0.015	0.004	***
Childbirth time 1	0.005	0.003		-0.004	0.006		-0.003	0.003	
Frequency	16.53%			64.97%			18.50%		

Source: Authors' calculations from EU-SILC 2015-2018 data. Time and country dummy variables are accounted for. Full set of covariates are included. Note: *p < .10, **p < .05, ***p < .01.

Table A3. Non-linear effects in the childbirth-poverty relationship: Childbirth equation (W model)

	Yeq <= 60% Median Yeq			60% Median Yeq <Yeq<= 150% Median Yeq			Yeq > 150% Median Yeq		
	Status: Poverty			Status: Average income			Status: Wealth		
	AME	s.e.		AME	s.e.		AME	s.e.	
Status time t-1	0.009	0.002	***	-0.005	0.002	***	0.004	0.003	
Childbirth time t-1	0.064	0.003	***	0.065	0.003	***	0.065	0.003	***
Status time 1	-0.005	0.002	**	-0.002	0.002		0.003	0.002	
Childbirth time 1	-0.010	0.002	***	-0.010	0.002	***	-0.010	0.002	***

Source: Authors' calculations from EU-SILC 2015-2018 data. Time and country dummy variables are accounted for. Full set of covariates are included. Note: *p < .10, **p < .05, ***p < .01.