Family formation and female employment: the educational gradient in full-time and part-time work in 10 European countries

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Abstract

Over the last decades the participation of women in the labour market has risen sharply in Europe because of better female education and increased rates of maternal employment. However, maternal employment rates show considerable variation between countries. Combining micro-data from the Generations and Gender Survey with contextual information from the OECD Family database, this paper uses multinomial multilevel regression to analyse the effects of micro and macro level characteristics on full-time and part-time employment among women in 10 European countries. We investigate the educational gradient in the effect of union formation on female activity status and how this differs between and within the countries considered. We also check whether cross-national differences in the availability of formal and informal childcare can explain cross-national differences in the effect of union formation. The results indicate that within country variation in activity status is largely overshadowed by the strong cross-national differences in female employment. Between-country variation in female employment is very small among childless women but increases rapidly after they have made the transition into motherhood. The number of children and the age of the youngest child in the household have a clear effect on female employment rates, but the size and the direction of the effects are different for full-time and part-time work, interact with educational attainment and further vary between countries. Between-country differences in the effect of union formation can be partially explained by differences in childcare use. Between-country variation in formal childcare has a larger impact on female activity status than between-country variation in informal childcare. Finally, both formal and informal childcare have a positive effect on both full-time and part-time employment in all educational groups with the effect being more articulated among higher educated women.

1. Introduction

A vast body of literature has studied the relationship between family formation and female employment. Nevertheless, some research paths are not sufficiently explored. *First*, most research on female labour force participation does not make the distinction between full-time and part-time work (Neels and Theunynck 2012). This is quite surprising given that part-time work is a strategy for women to reconcile the care for young children with labour force participation (Hakim 2003). OECD estimates show that there is considerable variation between European countries in part-time employment rates. For

instance, in the Netherlands and Austria it is very common for women to work part-time, whereas part-time employment rates are very low in Eastern Europe (OECD 2011). Part-time work may alleviate the role incompatibility between motherhood and female employment, but it has also been associated with lower wages, less job protection, limited opportunities for career advancement and fewer employment benefits (e.g. Blossfeld and Hakim 1991; Wright and Hinde 1991). As such, mothers with high career aspirations are unlikely to consider it an attractive (long-term) career path. *Second*, most comparative research in Europe has focused on cross-national differences in female activity status without paying enough attention to the fact that there may also be important differences within countries. Also this is rather surprising given that the characteristics of the labour market (and even of the cultural context) can differ strongly between regions within a country. Furthermore, regions sometimes have a certain degree of autonomy in the implementation of social and family policy, which is likely to affect the employment prospects of both men and women. *Third*, household formation is unlikely to affect maternal employment rates to the same extent in all educational groups. Given that the opportunity costs of a (temporary) exit from the labour market are much higher for better-educated women, we expect them to quickly return to (full-time) work. For lower educated women childbearing more frequently results in spells of part-time work or unemployment or inactivity. *Fourth*, most European countries have implemented family and social policies in order to facilitate the combination of work and family. Although there are considerable differences between countries in the type and extent of policy interventions (Gauthier 2007), they are all aimed to positively affect the return to (full-time) employment. However, research needs to pay more attention to educational differentials in the uptake of policy measures. For instance, the use of formal childcare is characterised by a strong positive educational gradient: on the one hand because higher educated women have more need for childcare and on the other hand because higher educated women are better informed about how to make use of childcare amenities (Storms 1995; Ghysels and Van Lancker 2009). Investments in public childcare are therefore likely to disproportionally facilitate the return of higher educated women to the labour market.

2. Aim of the paper and research hypotheses

This paper investigates the educational gradient in the effect of family formation on full-time and part-time employment among women in 10 European countries. We test the following research hypotheses:

Hypothesis 1: We expect female employment to vary both between and within countries. However, we expect the between country differences in female employment to be larger than the within country differences.

Hypothesis 2: We expect that higher educated women are less likely to reduce their labour supply after making the transition into parenthood. We further expect higher educated women to disproportionally choose for full-time work, whereas lower educated women disproportionally end up in part-time work or become unemployed or inactive.

Hypothesis 3: The negative effect of family formation on full-time labour force participation is expected to be less articulated in countries where social policies support women in the combination of work and family.

Hypothesis 4: Between country differences in the effect of union formation on female employment are expected to become smaller if we control for between country differences in the use of formal and informal childcare. We expect the reduction in the between country differences to be more pronounced for higher educated women since they are more likely to be confronted with the work-family conflict.

3. Data

The analyses make use of data from the first round of the Generations and Gender Survey (GGS). The GGS is an initiative aimed at comparative research about demographic changes in Europe. A focal point is how micro and macro level variables affect individual behaviour in various domains such as household and union formation, labour market participation, relations among partners and relations between parents and children. The comparative nature of the GGS is expressed by the GGS contextual database that holds country-specific information on characteristics of the overall labour market, demographics and social policy. In comparison with many other surveys the GGS benefits from a relative large sample size with a target sample of about 10.000 individuals per country. Currently first round data are available for 16 countries: Australia, Austria, Belgium, Bulgaria, Estonia, France, Georgia, Germany, Hungary, Italy, Lithuania, Netherlands, Norway, Poland, Romania and the Russian Federation. Data collection occurred between 2004 and 2008 among individuals aged 18-79 years old. The aim of the GGS is to set up a longitudinal research design but currently second round data are only available for five countries.

3.1 Selection of countries

In this paper we limit the analyses to ten European countries, excluding those with missing or insufficiently detailed information about household composition, activity status and region of residence. Estonia is excluded from the analysis since household members aged less than fifteen years old are merged into one age group making it impossible to identify households with (very) young children. Hungary is also not withheld in the analysis because no information is available about the region where respondents live. Poland is not retained in the analysis since no distinction can be made between full-time and part-time employment. Finally, Russia and Georgia are excluded from the analyses because these countries are not members of the European Union or European Free Trade Association and therefore do not have a NUTS classification (see section 5)[1]. For Russia and Georgia there is also no information available in the OECD Family database about the use of formal and informal childcare.

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[1] An additional reason to exclude Georgia from the analyses is that this country has very low female labour force participation rates. In multilevel regression models the country consistently came out as an outlier, which suggests that it should be studied individually.

3.2 Research population

The research population consists of women aged 20-49 years old at the time of the survey. This age range delineates the 'busy years' where women will complete their education, leave the parental home, form partnerships, have children and get established on the labour market. We set the upper age limit at 49 years so that our sample is less likely to contain women who are early retired and are no longer at risk of employment. We further limit the sample to women who have completed their education since educational enrolment is strongly negatively correlated with household formation and labour force participation.

3.3 Variables

Micro-level variables

The *dependent variable* is activity status with is based on the self-assessment of individuals. We identify three categories: i) full-time employment, (ii) part-time employment (iii) and unemployed/inactive. The last category will be the reference category throughout the analyses.

The *independent variables* are age of the respondent, level of education, partnership status, number of children in the household, and age of the youngest child in the household. *Age is* operationalized as a second-order polynomial to allow for a non-linear effect on activity status. *Level of education* is divided into three categories based on the ISCED classification: (i) low education (at most lower secondary education), (ii) medium education (secondary education) and (iii) high education (short or long term tertiary education). *Partnership status* has two categories: (i) cohabiting with a partner and (ii) not cohabiting with a partner. *Number of children in the household* and *age of the youngest child in the household*[2] are operationalized as a combination variable with five categories: (i) nokid (no children residing in the household), (ii) onetwokid_le2 (one or two children residing in the household with the youngest child being less than 3 years old), (iii) onetwo_ge3le5 (one or two children residing in the household with the age of the youngest child lying between 3 and 5 years), (iv) onetwokid_ge6 (one or two children residing in the household with the youngest child being at least 6 years old) and (v) threekid (3 or more children in the household irrespective of the age of the youngest child)[3].

Macro-level variables

We also include country-specific information about the use of formal and informal childcare. *Formal childcare* is operationalized as the average enrolment rate of children less than three years old in formal childcare. *Informal childcare* is

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[2] We do not make the distinction between biological children, stepchildren and foster children.

[3] We tried a more detailed operationalization of the combination variable with separate categories for households with one and two children. Unfortunately sample sizes are too small to estimate reliable variance components in multilevel models where the effects of these covariates are allowed to vary between countries (see section 4). We choose for a less detailed operationalization of the variable number of children in the household and for a more detailed categorization of the variable age of the youngest child in the household since additional analyses showed that the variation between countries in terms of activity status is greater for the age of the youngest child than it is for the number of children in the household.

operationalized as the percentage of children using informal childcare during a typical week. Both variables are drawn from the OECD Family database.

4. Methods

Using a three-level multinomial model we estimate the probability of full-time and part-time employment for an individual woman i living in region j in country k. Region of residence is classified based on the Nomenclature of Units for Territorial Statistics (NUTS). The standard is developed by the European Union to refer to regions within member states. A similar classification exists for European Union candidate countries as well as for member states of the European Free Trade Association (e.g. Norway). To allow for sufficient variation between regions and to have a sufficient sample size within each region we chose for the first level classification (NUTS1). For 10 countries, this classification resulted in 62 regions. For Lithuania and Norway we used the NUTS3 classification instead of the NUTS1 classification. For these countries the NUTS1 and the NUTS2 levels correspond to the entire country itself.

For a response variable with three categories the multilevel multinomial model has two equations. On the one hand it contrasts the log-odds of full-time employment (superscript [1] in the equation below) against the log-odds of being unemployed or inactive (superscript [3]). On the other hand it contrasts the log-odds of part-time employment (superscript [2]) against the log-odds of being unemployed or inactive. For reasons discussed in sections 6.1 and 6.2 we only allow the effect of the variable number of children and age of the youngest child in the household to vary between countries. We further stratified the model by level of education. As such the model below is defined for each educational group.

$$Log(odds^{(1)}/odds^{(3)}) = B_{0j}^{(1)} + B_{1k}^{(1)} + B_2^{(1)}age_{ijk} + B_3^{(1)}age^2_{ijk} + B_4^{(1)}partner_{ijk} + B_5^{(1)}nokid_{ijk} +$$

$$B_{6j}^{(1)}onetwokid\_le2_{ijk} + B_{7j}^{(1)}onetwokid\_ge3le5_{ijk} + B_{8j}^{(1)}onetwokid\_ge3le5_{ijk} + B_{9j}^{(1)}threekid_{ijk}$$

$$Log(odds^{(2)}/odds^{(3)}) = B_{0j}^{(2)} + B_{1k}^{(2)} + B_2^{(2)}age_{ijk} + B_3^{(2)}age^2_{ijk} + B_4^{(2)}partner_{ijk} + B_5^{(2)}nokid_{ijk} +$$

$$B_{6j}^{(2)}onetwokid\_le2_{ijk} + B_{7j}^{(2)}onetwokid\_ge3le5_{ijk} + B_{8j}^{(2)}onetwokid\_ge3le5_{ijk} + B_{9j}^{(2)}threekid_{ijk}$$

$B_{0j}^{(1)} = \gamma_{00}^{(1)} + \gamma_{01}formal\_le2^{(1)} + \gamma_{02}informal\_le2^{(1)} + u_{0j}^{(1)}$ $B_{0j}^{(2)} = \gamma_{00}^{(2)} + \gamma_{01}formal\_le2^{(2)} + \gamma_{02}informal\_le2^{(2)} + u_{0j}^{(2)}$

$$\begin{matrix} u_{0j}^{(1)} \\ u_{0j}^{(2)} \end{matrix} \sim N \quad 0 \quad \begin{matrix} \sigma^2_{00(1)} & \\ \sigma^{(1,2)}_{(00,00)} & \sigma^2_{00(1)} \end{matrix}$$

$B_{0k}^{(1)} = \gamma_{00}^{(1)} + \gamma_{01}formal\_le2^{(1)} + \gamma_{02}informal\_le2^{(1)} + u_{0k}^{(1)}$ $B_{0k}^{(2)} = \gamma_{00}^{(2)} + \gamma_{01}formal\_le2^{(2)} + \gamma_{02}informal\_le2^{(2)} + u_{0k}^{(2)}$
$B_{5k}^{(1)} = \gamma_{50}^{(1)} + \gamma_{01}formal\_le2^{(1)} + \gamma_{02}informal\_le2^{(1)} + u_{5k}^{(1)}$ $B_{5k}^{(2)} = \gamma_{50}^{(2)} + \gamma_{01}formal\_le2^{(2)} + \gamma_{02}informal\_le2^{(2)} + u_{5k}^{(2)}$
$B_{6k}^{(1)} = \gamma_{60}^{(1)} + \gamma_{01}formal\_le2^{(1)} + \gamma_{02}informal\_le2^{(1)} + u_{6k}^{(1)}$ $B_{6k}^{(2)} = \gamma_{60}^{(2)} + \gamma_{01}formal\_le2^{(2)} + \gamma_{02}informal\_le2^{(2)} + u_{6k}^{(2)}$
$B_{7k}^{(1)} = \gamma_{70}^{(1)} + \gamma_{01}formal\_le2^{(1)} + \gamma_{02}informal\_le2^{(1)} + u_{7k}^{(1)}$ $B_{7k}^{(2)} = \gamma_{70}^{(2)} + \gamma_{01}formal\_le2^{(2)} + \gamma_{02}informal\_le2^{(2)} + u_{7k}^{(2)}$
$B_{8k}^{(1)} = \gamma_{80}^{(1)} + \gamma_{01}formal\_le2^{(1)} + \gamma_{02}informal\_le2^{(1)} + u_{8k}^{(1)}$ $B_{8k}^{(2)} = \gamma_{80}^{(2)} + \gamma_{01}formal\_le2^{(2)} + \gamma_{02}informal\_le2^{(2)} + u_{8k}^{(2)}$
$B_{9k}^{(1)} = \gamma_{90}^{(1)} + \gamma_{01}formal\_le2^{(1)} + \gamma_{02}informal\_le2^{(1)} + u_{9k}^{(1)}$ $B_{9k}^{(2)} = \gamma_{90}^{(2)} + \gamma_{01}formal\_le2^{(2)} + \gamma_{02}informal\_le2^{(2)} + u_{9k}^{(2)}$

$$\begin{matrix} u_{0j}^{(1)} \\ u_{5j}^{(1)} \\ u_{6j}^{(1)} \\ u_{7j}^{(1)} \\ u_{8j}^{(1)} \\ u_{9j}^{(1)} \\ u_{0j}^{(2)} \\ u_{5j}^{(2)} \end{matrix} \sim N \quad \begin{matrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{matrix}$$

$$\begin{matrix}
\sigma^2_{00(1)} & & & & & & & \\
\sigma^{(1,1)}_{(00,50)} & \sigma^2_{50(1)} & & & & & & \\
\sigma^{(1,1)}_{(00,60)} & \sigma^{(1,1)}_{(50,60)} & \sigma^2_{60(1)} & & & & & \\
\sigma^{(1,1)}_{(00,70)} & \sigma^{(1,1)}_{(50,70)} & \sigma^{(1,1)}_{(60,70)} & \sigma^2_{70(1)} & & & & \\
\sigma^{(1,1)}_{(00,80)} & \sigma^{(1,1)}_{(50,80)} & \sigma^{(1,1)}_{(60,80)} & \sigma^{(1,1)}_{(70,80)} & \sigma^2_{80(1)} & & & \\
\sigma^{(1,1)}_{(00,90)} & \sigma^{(1,1)}_{(50,90)} & \sigma^{(1,1)}_{(60,90)} & \sigma^{(1,1)}_{(70,90)} & \sigma^{(1,1)}_{(80,90)} & \sigma^2_{90(1)} & & \\
\sigma^{(1,2)}_{(00,00)} & \sigma^{(1,2)}_{(50,00)} & \sigma^{(1,2)}_{(60,00)} & \sigma^{(1,2)}_{(70,00)} & \sigma^{(1,2)}_{(80,00)} & \sigma^{(1,2)}_{(90,00)} & \sigma^2_{00(2)} & \\
\sigma^{(1,2)}_{(00,50)} & \sigma^{(1,2)}_{(50,50)} & \sigma^{(1,2)}_{(60,50)} & \sigma^{(1,2)}_{(70,50)} & \sigma^{(1,2)}_{(80,50)} & \sigma^{(1,2)}_{(90,50)} & \sigma^{(2,2)}_{(00,00)} & \sigma^2_{05(2)}
\end{matrix}$$

$u_{6j}^{(2)}$	0	$\sigma_{(00,60)}^{(1,2)}$	$\sigma_{(50,60)}^{(1,2)}$	$\sigma_{(60,60)}^{(1,2)}$	$\sigma_{(70,60)}^{(1,2)}$	$\sigma_{(80,60)}^{(1,2)}$	$\sigma_{(90,60)}^{(1,2)}$	$\sigma_{(00,60)}^{(2,2)}$	$\sigma_{(05,60)}^{(2,2)}$	$\sigma_{06(2)}^2$		
$u_{7j}^{(2)}$	0	$\sigma_{(00,70)}^{(1,2)}$	$\sigma_{(50,70)}^{(1,2)}$	$\sigma_{(60,70)}^{(1,2)}$	$\sigma_{(70,70)}^{(1,2)}$	$\sigma_{(80,70)}^{(1,2)}$	$\sigma_{(90,70)}^{(1,2)}$	$\sigma_{(00,70)}^{(2,2)}$	$\sigma_{(05,70)}^{(2,2)}$	$\sigma_{(00,70)}^{(2,2)}$	$\sigma_{07(2)}^2$	
$u_{8j}^{(2)}$	0	$\sigma_{(00,80)}^{(1,2)}$	$\sigma_{(50,80)}^{(1,2)}$	$\sigma_{(60,80)}^{(1,2)}$	$\sigma_{(70,80)}^{(1,2)}$	$\sigma_{(80,80)}^{(1,2)}$	$\sigma_{(90,80)}^{(1,2)}$	$\sigma_{(00,80)}^{(2,2)}$	$\sigma_{(00,80)}^{(2,2)}$	$\sigma_{(00,80)}^{(2,2)}$	$\sigma_{(00,08)}^{(2,2)}$	$\sigma_{08(2)}^2$
$u_{9j}^{(2)}$	0	$\sigma_{(00,90)}^{(1,2)}$	$\sigma_{(50,90)}^{(1,2)}$	$\sigma_{(60,90)}^{(1,2)}$	$\sigma_{(70,90)}^{(1,2)}$	$\sigma_{(80,90)}^{(1,2)}$	$\sigma_{(90,90)}^{(1,2)}$	$\sigma_{(00,90)}^{(2,2)}$	$\sigma_{(00,90)}^{(2,2)}$	$\sigma_{(00,90)}^{(2,2)}$	$\sigma_{(00,90)}^{(2,2)}$	$\sigma_{(00,90)}^{(2,2)}$ $\sigma_{09(2)}^2$

5. Results

The results section consists of three parts. First we answer the question whether the variability in activity status mainly operates at the country or regional level and how countries and regions differ in terms of the employment rate of women. Second we discuss the results of the multivariate analyses where we estimate the effects of age, level of education, partnership status, the number of children and the age of the youngest child in the household on full-time and part-time employment. Third we check whether the availability of formal and informal childcare can explain cross-national and/or cross-regional variability in activity status.

5.1 Between country and between regional variability in activity status

We start the analysis with a three-level variance components model with no predictor variables (i.e. a null model). In this model we only allow the intercepts to vary between regions (i.e. $B_{0j}^{(1)}$ and $B_{0j}^{(2)}$) and countries (i.e. $B_{0k}^{(1)}$ and $B_{0k}^{(2)}$). The total variance in the response variable can be partitioned into three components: the between country variance (level 3), the between region variance (level 2) and the residual variation between individual women (level 1). The variance partition coefficient (VPC) is the percentage of the total variance in the response variable at each level of analysis. For models with categorical response variables, there is no estimate of the individual level variance since it is completely determined by the mean. In contrast to the regional and country variances, the individual level variance is also not measured on the standard logistic scale. Using the latent variable approach of Snijders and Bosker (1999) we take the variance of the standard logistic distribution (i.e. $\pi^2/3$) as the residual variation between individuals. Now that all three variances are on the same scale we can calculate the VPC. The percentage of the total variance in the response variable that is attributable to the country level is estimated as the variance at the country level divided by the sum of the variances at all three levels. Similarly, the percentage of the total variance in the response variable that is attributable to the regional level is estimated as the ratio of the variance at the regional level and the sum of the variances at all three levels.

$$VPC_{ijk}\ country\ level = \frac{\sigma^2_{country}}{\sigma^2_{country} + \sigma^2_{region} + \pi^2/3}$$

$$VPC_{ijk}\ regional\ level = \frac{\sigma^2_{region}}{\sigma^2_{country} + \sigma^2_{region} + \pi^2/3}$$

Table 1 shows the VPC's for full-time and part-time employment. We estimated separate null models for each educational group and for each category of the combination variable representing the number of children in the household and the age of the youngest child in the household. Three findings come forward.

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First, the variance in activity status that is attributable to the regional level is considerably lower than the between country variance. The between region variance for full-time and part-time employment never exceeds four per cent, suggesting that within country differences in employment rates are very small. However, there is considerable between country variation in activity status. Figures are somewhat higher for part-time than for full-time employment. For full-time employment, estimates of the between country variance range from 4.1 to 15.7 per cent, while for part-time employment they range from 5.7 to 18.2 per cent. The limited regional variation in activity status is somewhat surprising given that regions often have a certain degree of autonomy in labour market and social policy. To double-check we additionally estimated a two-level variance components model where region is the highest level of analysis. Contrary to the three-level model the results indicate that there is important regional variation in activity status (results not shown). This suggests the following: although there is evidence of regional variation in full-time and part-time employment, the variation between regions is 'overshadowed' by the large differences in activity status between countries. In a three-level variance components model, this translates into low VPC's for the regional level and large VPC's for the country level.

Table 1. Variance partition coefficients by level of education and number and age of the youngest child in the household

	Country level		Regional level	
	%Full-time	%Part-time	%Full-time	%Part-time
Education				
Low education	4.1	9.0	3.0	2.3
Medium education	7.1	13.8	1.6	1.5
High education	10.4	14.4	1.2	1.6
Number & age child				
Geenkid	1.3	5.7	3.8	2.3
1-2 kids <=2 years	13.9	17.5	0.3	1.5
1-2 kids 3-5 years	15.7	16.4	0.4	3.0
1-2 kids >=6 years	13.2	18.2	2.3	1.8
3+ kids	7.9	11.0	1.3	2.2

Second, the between country variance in full-time and part-time employment increases with level of education. This is not unexpected given that the trade-off between the uptake of childcare responsibilities and the further development of a professional career is more likely to be an issue for higher educated women, while at the same time European countries strongly differ in how they support women in the combination of work and family.

Third, an important finding is that among childless women the between country variance in full-time and part-time employment is very small. For full-time employment the VPC equals just 1.3 per cent and the coefficient is only slightly higher for part-time employment with 5.7 per cent. It suggests that in all countries childless women have more or less the same chances of securing a position on the labour market. It also implies that before the onset of

childbearing labour market outcomes of women are largely determined by individual level characteristics (age, education, etc.) and only to a limited extent by overall characteristics of the labour market. After women have made the transition into parenthood, however, the between country variance in employment rates increases rapidly. For women with one or two children the VPC's range from 13.2 to 18.2 per cent. Interestingly the differences between countries remain very high even when children get older. Previous research has shown that women gradually take up work again as their children get older, but our results suggest that this pattern does not occur uniformly in all European countries with important cross-national differences in both full-time and part-time employment. For women with three or more children the between country variance in activity status is again somewhat lower, but this is most likely due to the heterogeneous composition of this group.

The VPC's give a general indication of the variation in the employment rate across countries and regions, but do not reveal how individual countries and regions relate to one another. Figures 1 and 2 display the best linear unbiased predictors of the random country effects (BLUP's or empirical Bayes estimates) for full-time and part-time employment by level of education and for each category of the combination variable number of children and age of the youngest child in the household. The figure for region is included in appendix (figure A.1). The BLUP's give an indication of the deviation of the average employment prospects in a specific country relative to the employment prospects in the 'average' European country: i.e. the deviation of the mean employment rate in one country vis-à-vis the estimate of the grand mean over all countries in the dataset. The average European country in the graphs is depicted at the value 0 on the vertical axis.

Figure 1 plots the BLUP's of full-time and part-time employment by level of education (effects are on the logit scale)[4]. The general pattern is that women in Central and Eastern European countries are more likely to work full-time than in the average European country and less likely to work part-time. The opposite pattern is found in the German speaking countries and the Netherlands where women less frequently work full-time compared to the European average and more frequently work part-time. France, Italy, Belgium and Norway occupy an intermediate position with full-time and part-time employment rates balancing around the European average. As already indicated by the VPC's, the differences between the countries become more pronounced as the level of education increases. For full-time employment the number of countries that differ significantly from the average European country doubles if we compare lowly educated women with highly educated women.

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[4] Because the models are estimated using quasi-likelihood methods we do not conduct likelihood ratio tests in order to test whether a model with country effects fits significantly better than a model without country effects.

Figure 1. Best linear unbiased predictor of the random country effects (logit scale) for full-time and part-time work, stratified by level of education
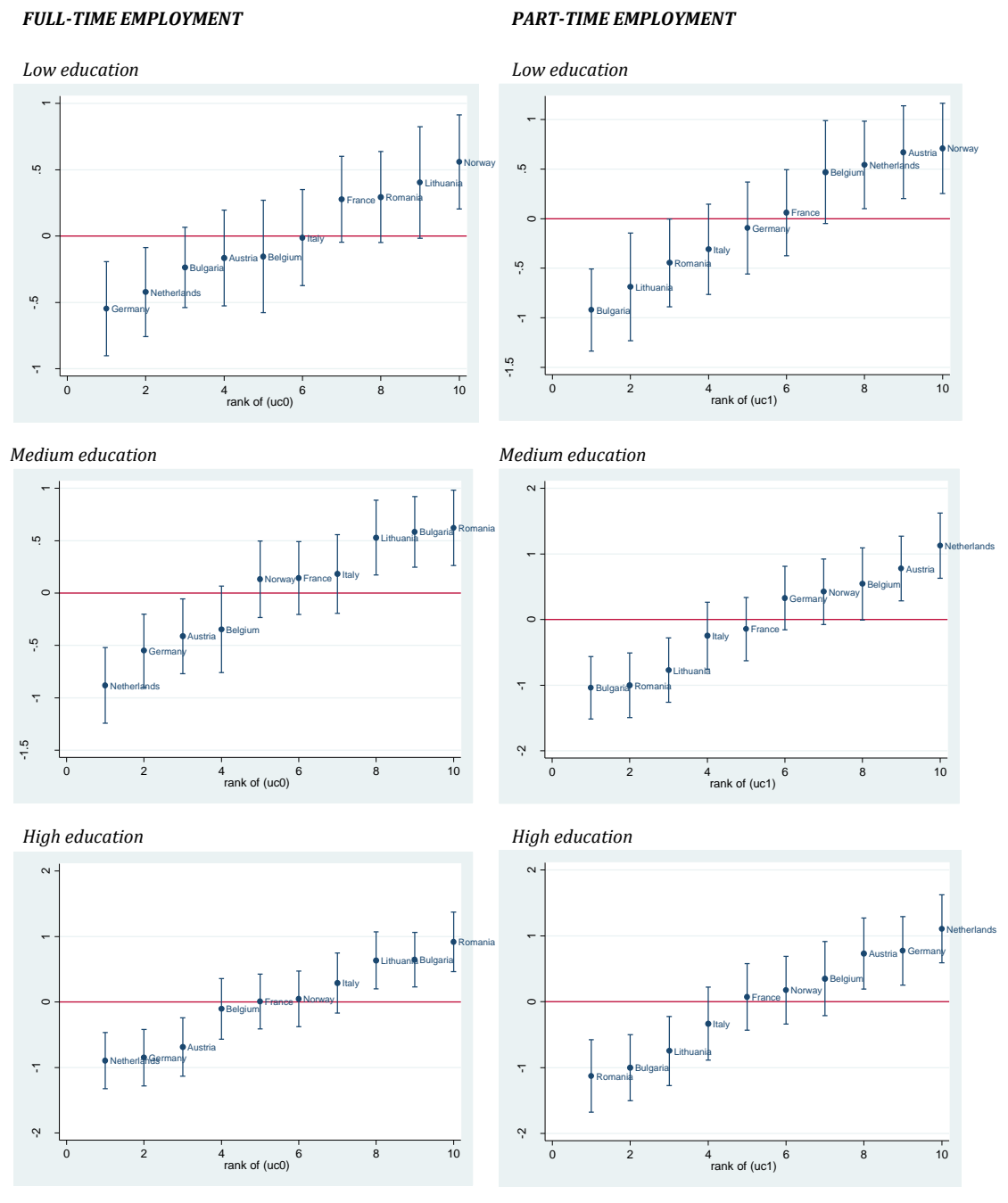

Figure 2 displays the random country effects of full-time and part-time employment according to the number of children and age of the youngest child in the household. The figure for the country effects at the regional level is included in appendix. Considering full-time employment among childless women, no country (except Germany) differs significantly from the average European country. Only for part-time employment some countries have differentials large enough to distinguish themselves from the European average

with part-time employment rates being lower in Bulgaria and Romania and somewhat higher in Norway and the Netherlands.

Important cross-national differences in maternal employment rates come forward among women with one or two children with the youngest child being less than three years old. Women living in Norway, Italy, France and Belgium are more likely to remain full-time employed short after childbirth compared to women living in Central and Eastern Europe and the German speaking countries. Central and Eastern European countries are further on the lower end of the distribution for part-time work, suggesting that women are more likely to work full-time than part-time if they decide to stay active on the labour market. Germany and Austria on the other hand occupy intermediate positions for part-time work, suggesting that women in these countries remain connected to the labour market but reduce their labour supply. As expected, the Netherlands takes a special position with part-time employment rates being considerably higher than in the other European countries. The large cross-national differences in maternal employment rates are likely related to country-differentials in the availability of formal childcare and the possibility for women to work part-time. This question will be discussed in more detail in section 6.3.

Interestingly when children are 3 to 5 years old, Eastern European mothers largely return to full-time work. Women living in Norway, Italy, France and Belgium now occupy an intermediate position, while the German-speaking countries and the Netherlands keep recording full-time employment rates significantly below the European average. Again women in the latter group of countries are clearly more likely to choose for part-time work compared to the average European mother. Possible reasons for the return to full-time employment among women in Central and Eastern Europe is that part-time jobs are scarce or that it is necessary for the woman to revert back to full-time work in order to sustain household income. Austria and the Netherlands stand out as the countries with very frequent part-time employment. The size of the random country effects hints at a strong cultural preference toward this labour market position.

The same pattern unfolds in households where the youngest child is at least 6 years old. Central and Eastern European countries again record the highest full-time employment rates, while the German-speaking countries and the Netherlands record the lowest rates. The reverse pattern comes forward if we look at the distribution of the random country effects for part-time work. Judging from the distribution of the effects it becomes clear that the larger VPC's for part-time work are to an important extent due to the more extreme position of the Netherlands and Austria[5]. Finally, for women with three or more children the same pattern comes forward as for mothers with one or two children but the distribution of the country effects is less clearly delineated than for the previous two categories. Again this is likely the result of the more heterogeneous composition of this group.

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[5] Considering model diagnostics: quantile-quantile plots show that the residual country effects for full-time and part-time employment approximately follow a normal distribution. Also the estimates of the variance components are clearly different from zero (results not shown).
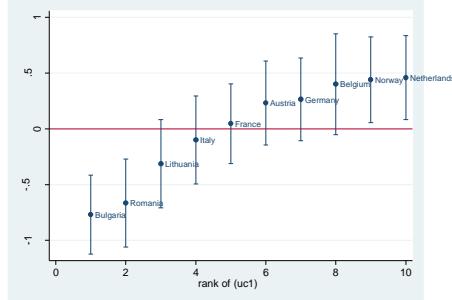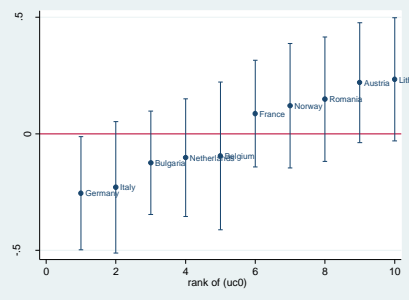
Figure 2. Best linear unbiased predictor of the random country effects for full-time and part-time work, stratified by level of education
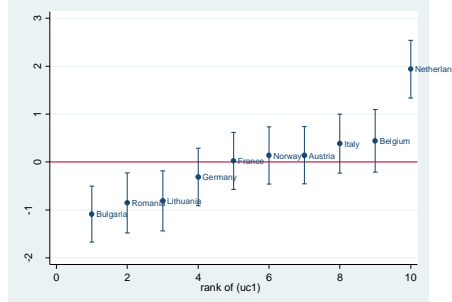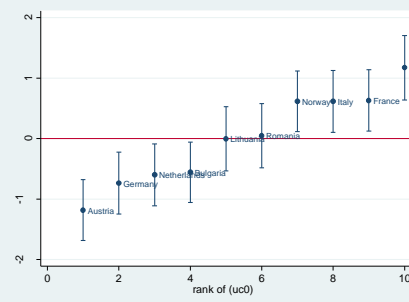

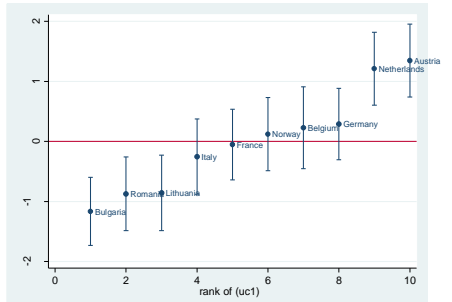*FULL-TIME EMPLOYMENT*

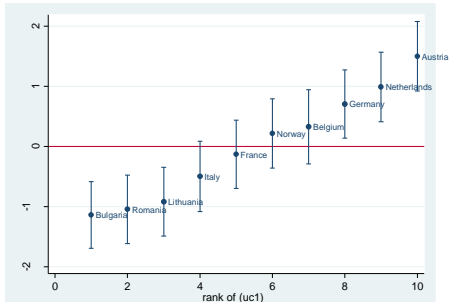*No children*

One or two children younger than 3 years

One or two children between 3 and 5 years

One or two children older than 5 years

Three children or more

PART-TIME EMPLOYMENT

No children

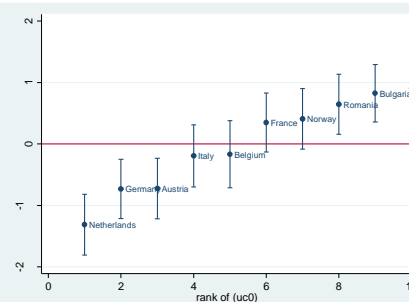*One or two children younger than 3 years*

One or two children between 3 and 5 years

One or two children older than 5 years

Three children or more
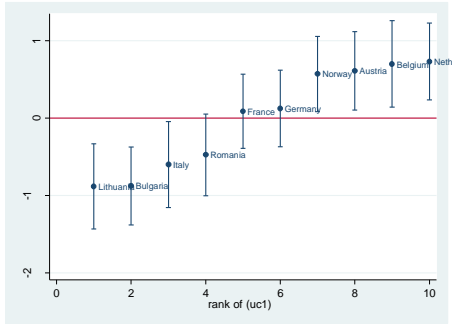
11
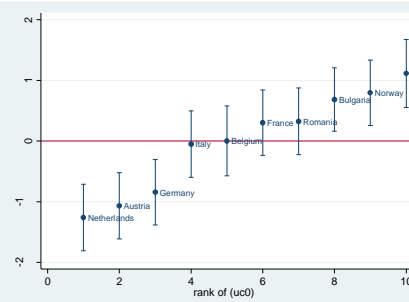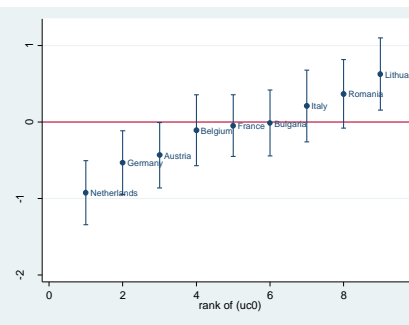
5.2 Multivariate analysis: the effects of age, education, partnership status, and number and age of children

In a subsequent step we add individual-level predictor variables to the null models. We stratify the models according to level of education in order to allow the effects of age, partnership status, number of children and age of the youngest child in the household to vary between educational groups[6]. The effects of age and partnership status are fixed and hence the coefficients of these covariates do not vary between countries[7]. As indicated in the equation above we only model random coefficients for the variable number of children and age of the youngest child, allowing the effect of this covariate to be different across countries. The results of the multivariate model are presented in table 2.

For both full-time and part-time employment the linear effect of age is positive while the effect of the quadratic term is negative, indicating that the probability of full-time and part-time employment increases with age and that the rate of increase levels off as women get older. Having a partner does not have the same effect on full-time employment in all educational groups. Among lower educated women there is no effect of partnership status on full-time employment. Among women with medium and higher levels of education a partner decreases the probability of full-time work but the effect is only significant for women with medium levels of education. The finding that a partner does not (negatively) affect full-time employment among lower educated women may suggest that female labour force participation in these households is necessary in order to sustain household income. Turning to the effect of partnership status on part-time employment, the effect is positive, significant and about of the same magnitude for all educational groups. In sum, the findings suggest that the male breadwinner model in Europe has not completely vanished: when a partner is present in the household women are more likely to reduce their labour supply or decide to work part-time.

The number of children and the age of the youngest child in the household has a clear effect on female employment rates, but the size and the direction of the effect is different for full-time and part-time work and further interacts with level of education. As expected, the presence of children aged less than 3 years old strongly decreases the probability of full-time work. The negative effect is somewhat more articulated among higher educated women, which is not surprising given that they are more likely to be faced with the work-family conflict. However, the fact that the negative effect is almost of the same size for lower educated women is interesting. Previous research has shown that lower educated women, on average, have more traditional views on the combination of

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[6] We tried to fit a single model where level of education and the number and age of children were included as main effects together with the interaction between them. Although this could have raised statistical power, it was not possible with the data to allow both the main effects of the variables and their interaction terms to vary between countries. Therefore we stratified the model according to level of education. In figure x we will plot the predicted log odds of full-time and part employment so that we can have an idea of the magnitude of the education effect.

[7] We tested whether the effects of age and partnership status varied between countries. Estimates of the variance components showed that the values were not really different from zero, suggesting limited between country variation.

work and the care for young children. Lower educated women are also hypothesised to have a weaker link with the labour market because of less interesting jobs, lower payment, etc. But our results suggest that the combination of work and family is as likely an issue for them as it is for higher educated women. Also with respect to part-time employment there is a negative effect of young dependent children on female participation rates. As expected the effect is less pronounced than for full-time employment, although it is still strongly negative and significant. The overall conclusion is that the presence of a young dependent child in the household reduces female employment, even when it concerns part-time work.

Consistent with previous research, maternal employment rates rebound when children get older. For women with children aged 3-5 years old the negative effect on full-time employment is more than half the size of the effect for women with dependent children aged less than 3 years old. Maternal employment rates increase further when the youngest child in the household is at least 6 years old, although they remain clearly lower compared to the full-time employment rate of women without children. The findings suggest that entry into motherhood leaves a permanent footprint on the full-time labour force participation of women. The opposite pattern comes forward when we look at part-time employment. There the presence of a child aged at least 3 years old results in a positive effect on female employment. The effect has an inverted u-shape pattern with the effect being more pronounced among women with medium levels of education.

In sum, the results suggest that short after childbirth women retreat from the labour market and particularly from full-time employment. When children get older mothers gradually return back to work. But compared to childless women they are less likely to work full-time and more likely to work part-time.

Table 2. Multinomial multilevel model of activity status (contrast are <u>full-time versus unemployed/inactive</u> and <u>part-time versus unemployed/inactive</u>), model stratified by educational attainment, models without and with control for formal and informal childcare use for kids younger than 2 years, women 20-49 years old

	Low education			Medium education			High education		
	Exp(b)	s.e.	Sig.	Exp(b)	s.e.	Sig.	Exp(b)	s.e.	Sig.
FULLTIME WORK									
ConsFull *(random)*	0.088	0.128		1.439	0.097	***	2.26	0.175	***
Agecen *(fixed)*	0.005	0.004		0.006	0.003	*	0.016	0.004	***
Age2cen *(fixed)*	-0.001	0.000	**	-0.001	0.000	***	-0.002	0.001	**
Partner *(fixed)*	0.014	0.072		-0.141	0.043	**	-0.064	0.062	
Nokid	-	-	-	-	-	-	-	-	-
OneTwokid_le2 *(random)*	-1.697	0.222	***	-2.113	0.272	***	-2.13	0.268	***
OneTwokid_ge3le5 *(random)*	-0.531	0.234	*	-0.967	0.251	***	-0.813	0.178	***
OneTwokid_ge6 *(random)*	-0.254	0.213		-0.532	0.226	*	-0.426	0.199	*
Threekid *(random)*	-1.148	0.216	***	-1.586	0.223	***	-1.984	0.146	***
PARTTIME WORK									
ConsPart *(random)*	-1.072	0.210	***	-0.437	0.201	*	0.101	0.246	
Agecen *(fixed)*	0.000	0.005		0.009	0.003	*	0.020	0.005	***
Age2cen *(fixed)*	-0.001	0.001	*	-0.001	0.000		-0.001	0.001	
Partner *(fixed)*	0.239	0.087	**	0.137	0.053	**	0.272	0.076	***
Nokid	-	-	-	-	-	-	-	-	-
OneTwokid_le2 *(random)*	-0.644	0.246	**	-0.685	0.225	**	-0.859	0.140	***
OneTwokid_ge3le5 *(random)*	-0.039	0.165		0.429	0.181	*	0.321	0.113	**
OneTwokid_ge6 *(random)*	0.399	0.156	*	0.525	0.182	**	0.429	0.141	**
Threekid *(random)*	-0.160	0.132		-0.255	0.119	*	-0.521	0.159	**

Note: <u>Agecen</u> = age centered at 36.3 years (grand mean); <u>Age2cen</u> = age centered squared; <u>Partner</u> = cohabiting partner; <u>Nokid</u> = no children living in the household, <u>OneTwokid_le2</u> = one or two kids with youngest aged less than 3 years; <u>OneTwokid_le2</u> = one or two kids with youngest aged older than 2 years, <u>Threekids</u> = three kids or more irrespective of age youngest child; <u>Formal_care_le2</u> = average enrolment rate of children not yet three years of age in formal childcare (country variable, grand mean centering at 29.3%); <u>Informal_care_GE3</u> = percentage of children using informal childcare during a typical week (country variable, grand mean centering at 23.8%)

Significance levels: * p < 0.05, ** p < 0.01, *** p < 0.001

Source: GGS (Bulgaria, Germany, France, Italy, Netherlands, Romania, Norway, Austria, Belgium, Lithuania)

Table 3 displays the estimates of the variance components of our multilevel model. Given that we only have 10 countries, it was not possible to estimate the unstructured variance-covariance matrix. Besides the variances of the intercepts and the variances of the random coefficients for the different categories of the variable number of children and age of the youngest child in the household, we only estimated the covariance terms between the intercepts for full-time work and the intercepts for part-time work at the country and regional level (covariance terms $\sigma_{(00,00)}^{(1,2)}$ in the equation above). Both covariance terms are positive, suggesting that in countries and regions where childless women are more likely to work full-time than in the average country or region are also more likely to be countries and regions where women work part-time. In other words, these are countries and regions where women have more favourable prospects on the labour market. All other covariance terms in the matrix are assumed to be zero[8].

Table 3. Variance-covariance matrix of the multinomial multilevel model

	Level of education		
	Low	*Medium*	*High*
Variance-covariance matrix: COUNTRY LEVEL			
Variance intercepts: Full-time	0.070	0.052	0.256
Variance coeff. OneTwokid_le2: Full-time	0.253	0.682	0.634
Variance coeff. OneTwokid_ge3le5: Full-time	0.380	0.575	0.222
Variance coeff. OneTwokid_ge6: Full-time	0.377	0.482	0.328
Variance coeff. Threekid: Full-time	0.332	0.434	0.081
Covariance: interc. full-time – interc. part-time	0.138	-0.096	-0.336
Variance intercepts: Part-time	0.300	0.341	0.519
Variance coeff. OneTwokid_le2: Part-time	0.343	0.429	0.082
Variance coeff. OneTwokid_ge3le5: Part-time	0.044	0.256	0.010
Variance coeff. OneTwokid_ge6: Part-time	0.128	0.283	0.104
Variance Coeff. Threekid: Part-time	0.019	0.060	0.083
Variance-covariance matrix: REGION LEVEL			
Variance Intercepts: Full-time	0.097	0.073	0.023
Covariance(Interc. full-time – interc. part-time)	0.017	-0.026	-0.037
Variance Intercepts: Full-time	0.074	0.072	0.057

The variance components for number of children and age of the youngest child indicate the extent to which the effect of this covariate differs between countries.

---

[8] We also estimated additional models where we tried to fit the other covariance terms. The values of the covariance terms that could be estimated were sometimes different from zero. The reasons not to retain them in the current analysis are threefold. First, we wanted to compare models that have the same structure of the variance-covariance matrix. Second, estimation of the covariances did not affect the estimates of the variance components of the intercepts and the random coefficients of number of children and age of the youngest child in the household. Third, calculation of the correlation often resulted in values outside the range of -1 and 1, indicating a poor fit of the data by the model. Note however that the correlation between the regional intercepts of full-time and part-time employment for higher educated women in table x just lies outside these boundaries as well (correlation of -1.02 = -0.037/sqrt(0.023*0.057)). As such, the model fitted in this paper has clearly reached the limit of what can be reliably done with the data.

We see that the variances of the random coefficients are clearly different from zero with estimates being larger for full-time than for part-time employment. Estimates for full-time employment are particularly large for medium and higher educated women who have children of less than 3 years old. For mothers of children that are at least 3 years old, between country differences in full-time employment are somewhat larger for lower and medium educated women. Finally, figure 3 plots the best linear unbiased predictors of the random country effects for full-time and part-time employment by level of education for women aged 36 years old who live with a partner.

Figure 3. Best linear unbiased predictor of the random country effects for full-time and part-time work, stratified by level of education
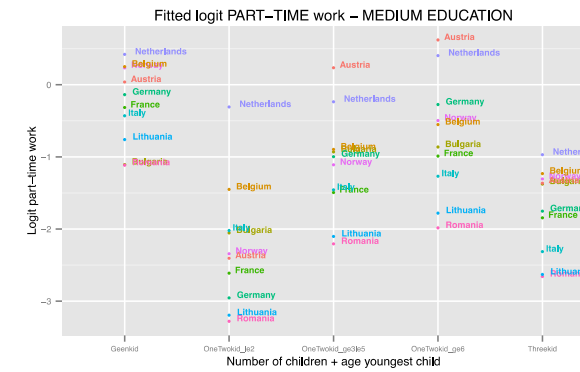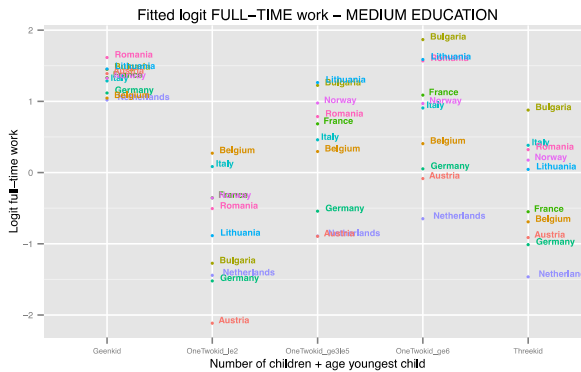
FULL-TIME EMPLOYMENT

PART-TIME EMPLOYMENT

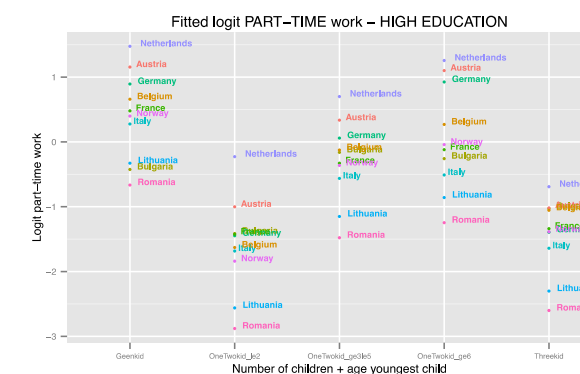*Low education*
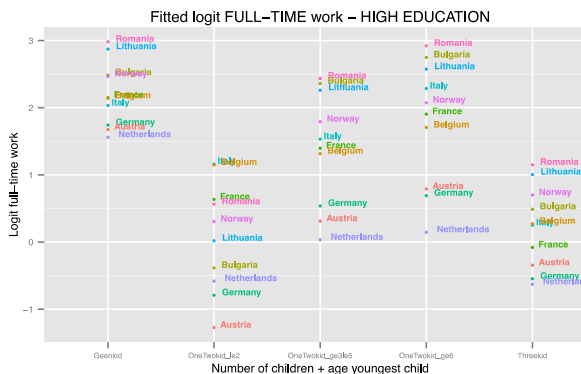
Low education
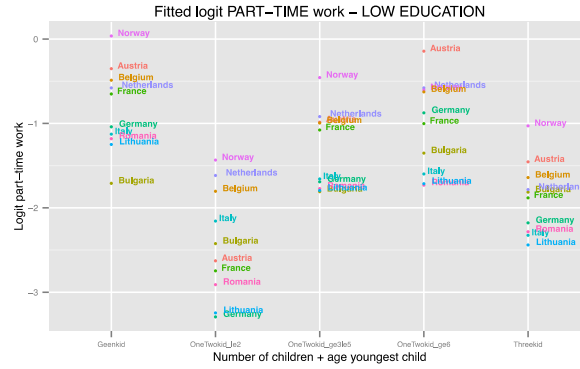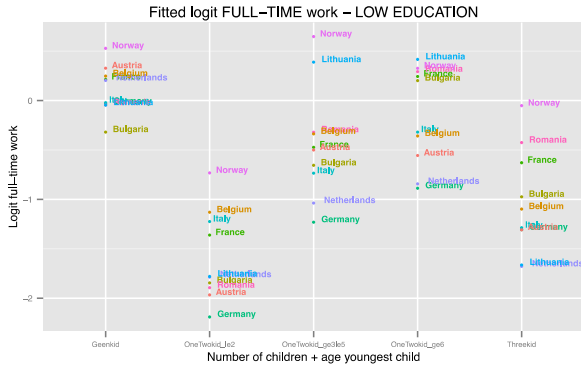
Medium education

Medium education

High education

High education

5.3 The effect of childcare availability

The last questions we want to address is whether the effect of childcare use on female labour force participation varies by level of education and whether between country differences in childcare use can explain between country differences in the effect of the number and age of the youngest child in the household.

Table 4 displays the use of formal and informal childcare in the 10 countries considered. There are important between country differences with reliance on formal childcare being high in France, Norway, Belgium and the Netherlands. The average enrolment rate in these countries ranges from 42.0 to 51.3 per cent. Use of formal childcare is low in the Central and Eastern European countries with figures balancing around 14 and 15 per cent. Enrolment rates are also low in the German-speaking countries: 17.8 per cent in Germany and as low as 12.1 per cent in Austria. Italy that was previously characterised by low childcare availability now occupies an intermediate position with 29.2 per cent. Also with respect to informal childcare use there are important between country differences. Figures range from 45.8 and 51.9 per cent in Romania and the Netherlands to 4.3 and 12.5 per cent in Norway and Lithuania. The high reliance on formal and informal childcare in the Netherlands is somewhat surprising given the strong tendency of women to work part-time.

Table 4. Use of childcare (national percentages, OECD family database): average enrolment rate of children not yet three years of age in formal childcare and percentage of children using informal childcare during a typical week

Country	% using formal childcare	% using informal childcare
Bulgaria	14.6	25.7
Germany	17.8	14.5
France	42.0	17.7
Italy	29.2	31.5
Netherlands	55.9	51.9
Romania	14.3	45.8
Norway	51.3	4.3
Austria	12.1	19.8
Belgium	48.4	20.9
Lithuania	13.7	12.5
Country average	29.3	23.8

Source: OECD Family database

In table 5 we add cross-level interaction terms between the use of formal and informal childcare on the one hand and the variable number and age of the youngest child on the other hand. Unfortunately it was not possible to use the same operationalization as in the previous models. The variable number and age of the youngest child is now categorized as a dichotomy with a category for mothers of children aged less than 3 years old and a category representing all other women in the sample. The results indicate that the availability of childcare positively affects full-time and part-time labour force participation in all educational groups. The effect is stronger for formal than for informal childcare, and as expected, the size of the effect increases with level of education.

Table 5. Multinomial multilevel model of activity status (contrast are <u>fulltime versus unemployed/inactive</u> and <u>parttime versus unemployed/inactive</u>), model stratified by educational attainment, models without and with control for formal and informal childcare use for kids younger than 2 years, women 20-49 years old

	Low education						Medium education						High education					
Model	1			2			3			4			5			6		
	Exb(b)	s.e.	Sig.	Exb(b)	s.e.	Sig.	Exb(b)	s.e.	Sig.	Exb(b)	s.e.	Sig.	Exb(b)	s.e.	Sig.	Exb(b)	s.e.	Sig.
FULLTIME WORK																		
ConsFull *(random)*	-0.157	0.151		-0.158	0.152		1.052	0.188	***	1.047	0.187	***	1.975	0.226	***	1.971	0.226	***
Agecen *(fixed)*	0.001	0.004		0.001	0.004		-0.004	0.002		-0.004	0.002		-0.009	0.004	*	-0.009	0.004	*
Age2cen *(fixed)*	-0.001	0.000		0.000	0.000		0.000	0.000		0.000	0.000		-0.001	0.000	*	-0.001	0.000	
Partner *(fixed)*	-0.111	0.067		-0.112	0.067		-0.334	0.040	***	-0.330	0.040	***	-0.207	0.057	***	-0.211	0.057	***
Kid_le2 *(random)*	-1.609	0.191	***	-2.413	0.465	***	-1.776	0.264	***	-3.487	0.563	***	-1.934	0.275	***	-3.710	0.548	***
Formal_care_le2*OneTwokid_le2				0.026	0.010	**				0.043	0.013	**				0.057	0.012	***
Informal_care_le2* OneTwokid_le2				-0.001	0.011					0.018	0.015					0.006	0.015	
PARTTIME WORK																		
ConsPart *(random)*	-0.891	0.211	***	-0.892	0.212	***	-0.173	0.248		-0.179	0.247		0.268	0.245		0.267	0.245	
Agecen *(fixed)*	0.003	0.005		0.003	0.005		0.014	0.003	***	0.013	0.003	***	0.021	0.004	***	0.021	0.004	***
Age2cen *(fixed)*	-0.002	0.001	**	-0.002	0.001	**	-0.002	0.000	***	-0.002	0.000	***	-0.002	0.001	***	-0.002	0.001	***
Partner *(fixed)*	0.268	0.083	**	0.268	0.083	**	0.258	0.051	***	0.261	0.051	***	0.423	0.07	***	0.414	0.07	***
Kid_le2 *(random)*	-0.902	0.208	***	-1.813	0.592	**	-1.069	0.23	***	-2.888	0.317	***	-1.229	0.142	***	-2.637	0.297	***
Formal_care_le2*Kid_le2				0.020	0.013					0.031	0.007	***				0.038	0.007	***
Informal_care_le2*Kid_le2				0.009	0.015					0.034	0.008	***				0.015	0.008	*

Note: <u>Agecen </u> = age centered at 36.3 years (grand mean); <u>Age2cen</u> = age centered squared; <u>Partner</u> = cohabiting partner; <u>Kid_le2</u> = kids in household aged less than 3 years; <u>Kid_le2XFormal_care_le2</u> = interaction term between Kid_le2 and average enrolment rate of children not yet three years of age in formal childcare (country variable, grand mean centering at 29.3%); <u>Kid_le2XInformal_care_le2</u> = interaction term between Kid_le2 and average enrolment rate of children not yet three years of age in formal childcare (country variable, grand mean centering at 23.8%)

Significance levels: * p < 0.05, ** p < 0.01, *** p < 0.001

Source: GGS (Bulgaria, Germany, France, Italy, Netherlands, Romania, Norway, Austria, Belgium, Lithuania)

Finally, table 6 displays the estimates of the variance components for the model without the cross-level interaction terms and for the model with the cross-level interaction terms. If we compare the estimates for women with a young dependent child we see that between country differences in childcare use have reduced the size of the variance components, suggesting that between country differences in the effect of young dependent children is partially explained by cross-national differences in (formal) childcare use.

Table 6. Variance-covariance matrix of the multinomial multilevel model

| | Level of education | | | | | |
| | Low | | Medium | | High | |
	(1)	(2)	(1)	(2)	(1)	(2)
Variance-covariance matrix: Country LEVEL						
Variance intercepts: Full-time	0.158	0.158	0.320	0.316	0.470	0.472
Variance coeff. Kid_le2: Full-time	0.190	0.112	0.655	0.428	0.699	0.478
Covariance: interc. full-time – interc. part-time	-0.037	-0.043	-0.379	-0.374	-0.489	-0.490
Variance intercepts: Part-time	0.356	0.357	0.573	0.565	0.535	0.535
Variance coeff. Kid_le2: Full-time	0.268	0.313	0.480	0.101	0.127	0.062
Variance-covariance matrix: REGION LEVEL						
Variance Intercepts: Full-time	0.106	0.106	0.077	0.077	0.033	0.033
Covariance(Interc. full-time – interc. part-time)	0.012	0.012	-0.029	-0.03	-0.047	0.047
Variance Intercepts: Full-time	0.077	0.077	0.076	0.079	0.069	0.068

Appendix

Figure A.1. Best linear unbiased predictor of the random regional effects for full-time and part-time work, stratified by level of education
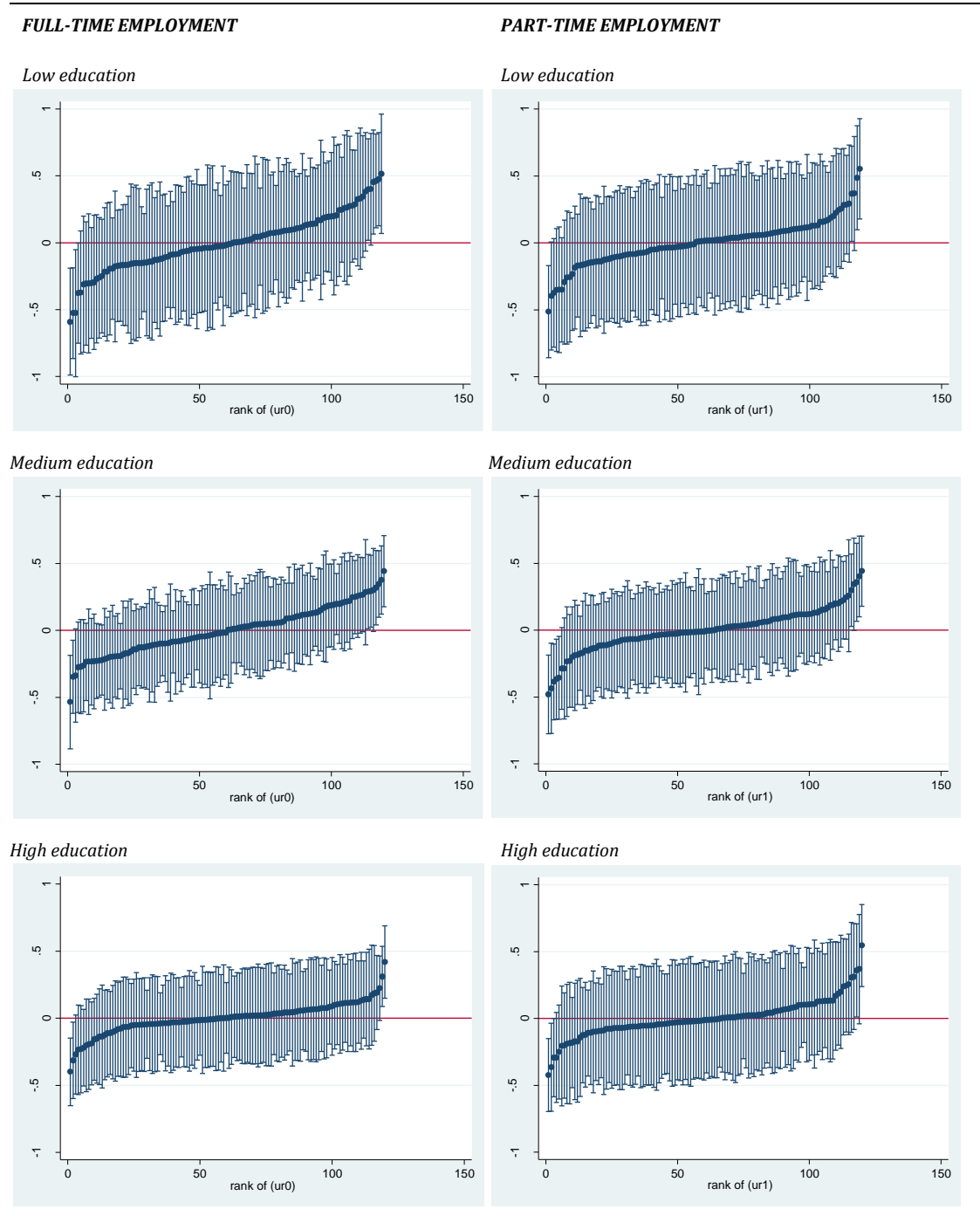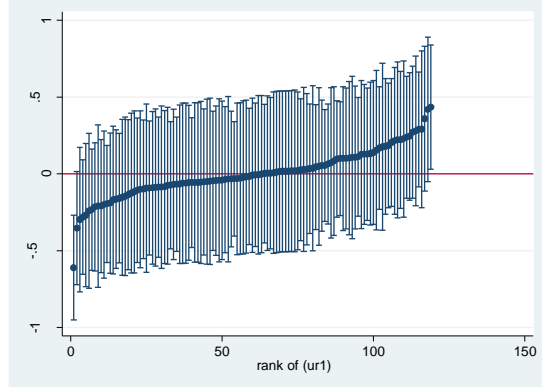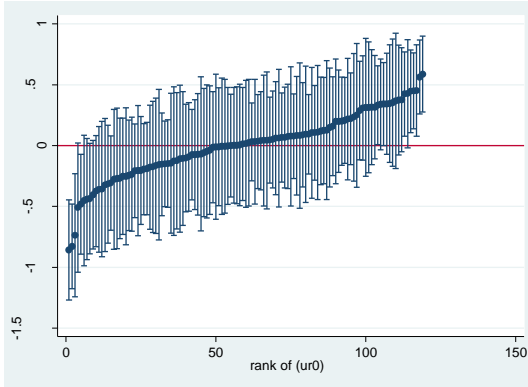
FULL-TIME EMPLOYMENT

Low education


PART-TIME EMPLOYMENT

Low education

Medium education

Medium education

High education

High education

Figure A.2. Best linear unbiased predictor of the random regional effects for full-time and part-time work, stratified by level of education

FULL-TIME EMPLOYMENT

No children

One or two children younger than 3 years

One or two children between 3 and 5 years

One or two children older than 5 years
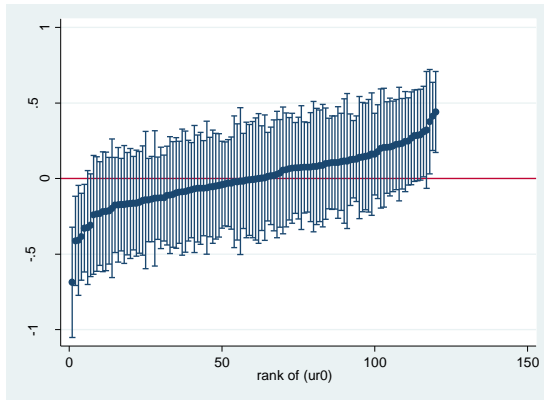
PART-TIME EMPLOYMENT
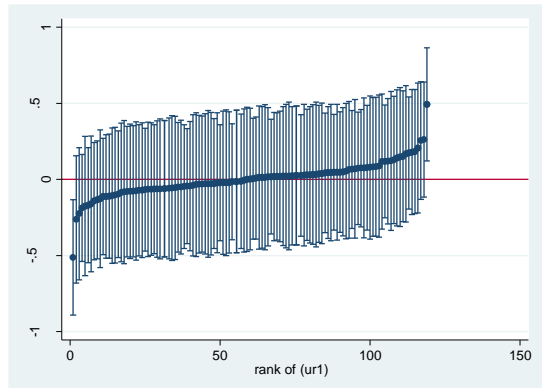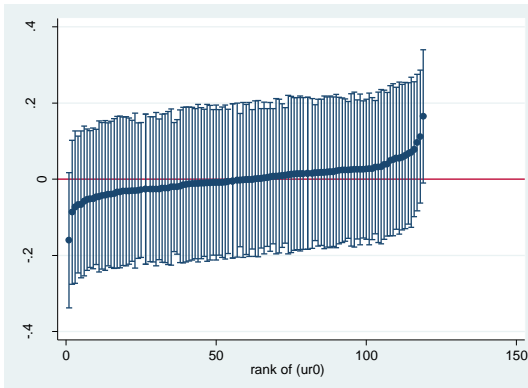
No children

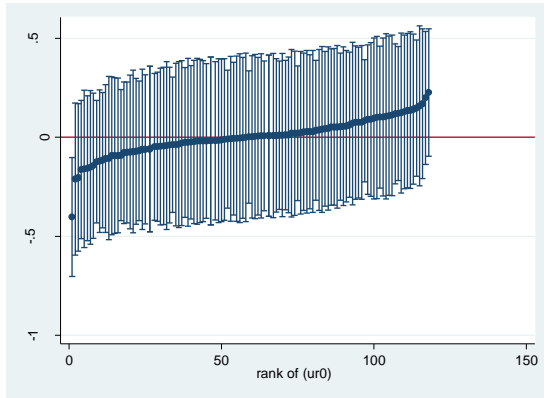*One or two children younger than 3 years*

One or two children between 3 and 5 years
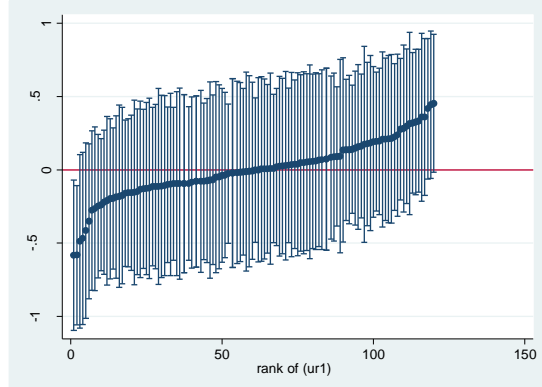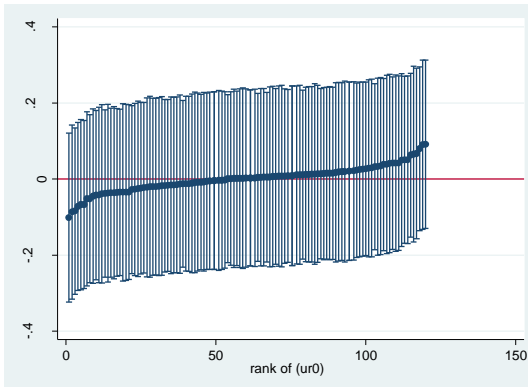
One or two children older than 5 years
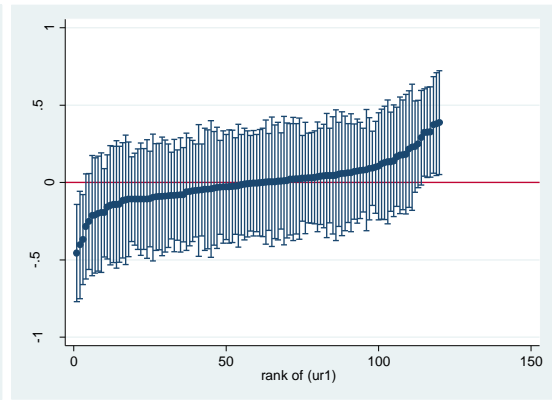
Three children or more

Three children or more