

Female labour supply and child-care provisions in Europe

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The paper presents the results of an analysis of the effect of child care provisions on female labour supply in Europe. Sections 1 and 2 review trends and existing evidence on female labour supply, highlighting the importance of child care policies. Section 3 is a summary of variation in child care provisions across EU member states. Section 4 outlines the results of a cross country multivariate analysis of mothers' labour supply and family provisions in selected in EU member states, where labour supply indicators are calculated from micro-level LFS data. Section 5 presents estimates of the same effect on individual level data using the EU-LFS.

Although the analysis was constrained by lack of data, results confirm earlier estimates using a rougher measure of labour supply and also lead to more precise conclusions concerning education specific effects. In the country level data we find that day care services are more likely to help increase participation for mothers with no education, while cash transfers have a strong negative effect on their probability of employment, at least in the CEE. By contrast, higher educated mothers are less discouraged by cash transfers than their less educated peers and are practically not affected by the availability of day care services – except in transition countries. A conversion of cash transfers into day care provision would yield the highest rise in employment rates among mothers with secondary education, where both effects are strong, and especially so in transition countries. The effects in the individual level data are less clear as there is no information on transfers available to the individual – we use the country level aggregates as context variables instead. In transition countries, the effects are strong, significant and of the same sign as in the country level estimates. The negative effect of cash transfers on maternal employment is unclear in EU-15 countries.

1. Female labour force participation in Europe

Female participation in the EU-15

The female employment rate varies considerably across old EU member states. The lowest rates (around 60 % in 2005) are observed in the South (Spain, Greece and Italy), but Catholic Ireland (67%) and Belgium (70 %) are also at the low end. At the high end, with employment rates of around 80 %, we find Nordic countries (Sweden, Denmark and Finland) while the others are around or somewhat above the average of the EU-15 (70 % in 2005). On average, female employment has risen steadily since the early 1990s. Most countries followed this trend, but some exhibited a much steeper rise (Ireland, Spain and Holland). The convergence of employment rates is quite spectacular: in 1992, rates varied between 39 and 87 %, and over 25 years, this reduced to a range of 59 to 82%.

Female participation in transition countries

In former socialist accession countries, women took an almost equal share of jobs and as a legacy of this, female labour force participation is still high in most Central and Eastern European countries (CEE) newly admitted to the European Union (EU). The marked drop in female participation after the collapse of the socialist system was almost universal in CEEs,¹ but

¹ The drop in the female participation rate (age 15-64) from 1990 to 1993 varied between 2 % (in Hungary) and 8 % points (in the Czech Republic) (Nesporova (2002) and Eurostat on-line database).

there seems to be considerable variation in labour market developments following the economic recovery. In the Baltic states and the Slovak Republic, participation has remained high and has been increasing recently. In Hungary, the female activity rate dropped to 50 percent (from 66% in 1980), the lowest among all new member states, but has increased steadily since 1997. The Czech Republic, Poland, and Slovenia have followed an altogether different path: the female participation rate has been continuously falling in these countries and is now below or just above the average of the EU-15.

2. Theory and existing evidence on the determinants of female labour force participation

In the economic literature, standard labour supply models describe the choice of labour force participation as essentially dependent on the expected gains and cost of employment, and on personal preferences for non-market time. In this framework, the costs of child care and the value of household production may be interpreted as a cost or opportunity cost of employment, while the value of children may be assumed to increase the value of time spent at home and outside formal employment.

There is a large empirical literature that explains the gradual increase of women's labour force participation since World War II in the above economic framework (see Killingsworth and Heckman (1986) and Blundell and MaCurdy (1999) for an overview). In this literature, the emphasis is on technology development, which made workplaces more suitable for women and also reduced the time needed for managing the household. Skill-biased technological change in recent years may have favoured women, so that the increase in female employment is increasingly determined by rising demand. Recent studies focus on the effect of wage offers to women and typically find that, although rising real wages have contributed to further increases in female labour supply, much of it is due to not easily measurable social phenomena such as the breakup of the traditional division of roles in the family (Blau and Kahn (2005)).

A wealth of microeconomic studies look at the labour supply of married women in the US, where the main finding is that women have a higher own-wage elasticity compared to men.² Also, being secondary earners within the family, women are likely to be more affected by their spouse's wages (Blau and Kahn 2005). A related strand of the literature that examines the husband's unemployment as an incentive to married women's employment (the added worker effect) tends to find a positive, but small effect (Stephens (2001)).

Pissarides, et al. (2005) note however that there is still considerable variation in female participation across countries, which cannot be explained by technology development and the associated changes in wage levels and the gender pay gap. In a detailed examination of European labour markets, Pissarides, et al. (2005) suggest some factors that may shape cross country differences in women's employment, including the institutional features of the labour market, social norms and attitudes perhaps based on religious affiliation, and also, the availability of publicly financed child care facilities.³ Examining a sample of OECD countries, they find that, controlling for fixed characteristics of countries (such as attitudes), product market regulation (measured as start-up costs) tends to discourage female employment, while the effect of public child care provisions is positive but not statistically significant.

² This is explained by the traditional division of labour in the family, in which women choose between market work, home production and leisure, while men choose between market work and leisure (Mincer (1962)). As women have closer substitutes for time spent in market work than men do, changes in market wages are expected to have larger substitution effects on women's labour supply.

³ Childcare and daycare are used interchangeably throughout this paper. These are meant to include nurseries (for children aged under 3) and kindergartens (educationally oriented care for children over 2).

Jaumotte (2003) focuses on policy instruments aimed at increasing female labour supply and provides some more conclusive evidence on the role of state financed support for families. Using data from OECD countries for 1985-1999, she finds that lower tax disincentives to the second earner in the household, childcare subsidies, and paid parental leave increase the female participation rate while child benefits tend to reduce it. The availability of part time jobs also has a positive effect in most countries. Apps and Rees (2001) also find that individual rather than joint taxation, and a policy to provide alternatives to domestic child care as opposed to cash payments, are likely to increase female labour supply. In a study of nine EU member states Ruhm (1998) shows that parental leave increases women's employment, but long periods of leave tend to reduce relative wages. Chevalier and Viitanen (2002) show that the availability of childcare determines participation (and not the other way round) and that women could be constrained in their labour force participation by the lack of childcare facilities. Scharle (2007) examines the impact of the transition shock on female labour force participation in former socialist countries in Central and Eastern Europe. These countries encouraged women to work full time and provided various in-kind and cash transfers to mothers. Accordingly, female labour supply was high in socialism but decreased sharply during the transition to market economy, which could be explained either by the structural changes in the labour market, or by the withdrawal of family benefits and services. Based on regression analysis of a country panel, Scharle (2007) finds that labour market conditions, rather than welfare policies, explain most of the decline in female participation during the transition. However, child-care provisions are an important determinant of current variation in the level of female participation in CEE.

There is also some evidence from micro studies of publicly provided child-care programmes in individual countries that show small but positive effects on female labour supply (see Blau (2003) for a review of the US literature.)

Demographic trends, and most notably, fertility is also a key factor. In most empirical studies, the presence of young children tends to reduce the labour force participation of women, but it is unclear if this is a causal relationship. Engelhardt, et al. (2004) find causality between fertility and female employment in both directions and suggest that this may be due to the influence of a common third factor or factors such as social norms, social institutions and financial incentives. In a similar vein, Apps and Rees (2001) note that the historical trend of rising participation and falling fertility is changing in high income countries, and suggest that the previously observed negative correlation between fertility and participation was never a structural relationship but a result of institutional structures that made employment and home duties incompatible.

Finally, there is some evidence that attitudes towards male and female roles may influence the labour supply decisions of women. Antecol (2003) uses attitude survey data from a wide range of countries (also including some CEEs) and finds that women are more likely to work in paid jobs if men in their country approve of women's labour force participation. Using data for OECD countries, Algan and Cahuc (2005) show that attitudes to gender roles in the family have a strong influence on female labour force participation even after controlling for cross country variation in labour market institutions and family policies.

3. Child care provision

Child care provision in old member states

Provisions for pre-school child care vary considerably across old member states, depending on the welfare regime, attitudes, and to some extent, on labour market institutions. Traditionally, Nordic countries provide publicly funded services, universally available to mothers, while in Southern and Anglo-saxon countries state support under school age is minimal as mothers are expected to rely on their extended families or on private service providers. Continental countries lie somewhere in between with a stronger role for employment or insurance based provisions. Recent reforms aimed at increasing female participation seem to have shifted provisions towards the Nordic model in several EU member states, as it seems to answer concerns both about employment levels and gender equality in reconciling work and family responsibilities.

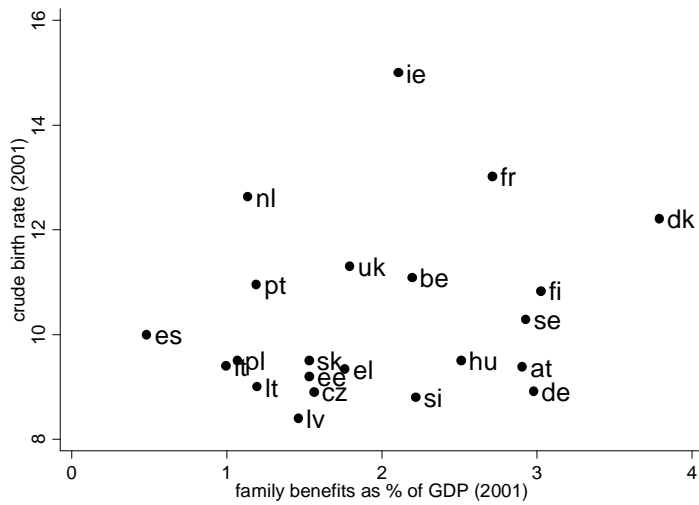
Child care provision in transition countries

In most former socialist countries governments sought to increase female labour supply and introduced various provisions in order to facilitate female participation. Cash benefits included a birth grant, paid maternity and parental leave, child care benefit, and family allowances to parents of school age children. Such benefits were wide spread and usually more generous than in Western Europe. In the 1980s, governments in Central and Eastern Europe spent twice as much on cash and in-kind family support as OECD countries in proportion to their national income (Sipos (1994)). The most important in-kind benefit was cheap or free day care for pre-school children, often maintained by enterprises, so that eligibility depended on the mother's employment.

Reviewing social policy reform during and after the transition, Barr (2005) argues that the direction of reforms followed from the nature of the transition process and from constraints imposed by EU accession. For example, the decline in state revenues forced the Czech Republic, Hungary and Poland to reduce benefit amounts or tighten eligibility around 1995, moving away from universal access to family policies and introducing an income test (Förster and Tóth (2001)). In other countries such reforms came later, or took less severe forms. Latvia for example even extended entitlement to maternity benefit and abandoned means testing in 1996. Or, while most CEEs reduced the replacement rate of insured maternity benefit, Slovenia retained a 100 % rate. As Stropnik (2004) notes, such reforms resulted in a wide range of scenarios with no clear pattern of change across former socialist states.

However, a reduction in cash benefits for families was apparently unavoidable in all CEEs. As the figure below shows, by 2001, levels of spending dropped below the average of the EU-15, so that spending on family benefits became by and large proportional to fertility rates, as in the old member states.

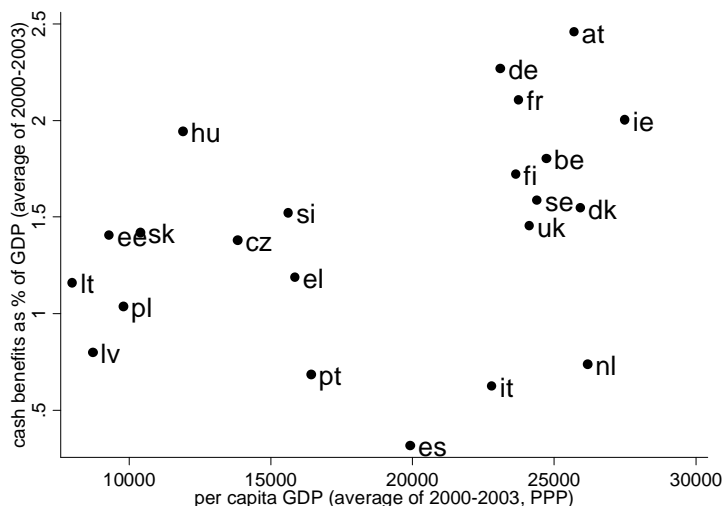
Figure 1. Family benefits (cash and in kind) and fertility in 2001
(8 new and 14 old member states)



Source: Scharle (2007), Eurostat on-line database. Note: cz=Czech Republic, ee=Estonia, lv=Latvia, lt=Lithuania, hu=Hungary, pl=Poland, si=Slovenia, sk=Slovak Republic, and eu15= old member states of the EU at=Austria, be=Belgium, fr=France, de=Germany, el=Greece, es=Spain, ie=Ireland, it=Italy, nl=Netherlands, pt=Portugal, fi=Finland, uk=United Kingdom.

Total spending on cash transfers to families is still large in CEEs in comparison with the level of national income. The figure below shows that Hungary devotes a particularly high share of their national income to cash family benefits, not only compared to lower income EU members Portugal and Greece, but also compared to Sweden and Denmark, which both have an extended welfare system and a high level of national income. In some CEEs, concerns about slowing (or in some countries, negative) population growth override economic arguments for implementing further cuts in family provisions.

Figure 2. Average of cash transfers and GDP in 2000-2003
(8 new and 14 old member states)



Source: Scharle (2007), Eurostat on-line database.

Recent adjustments in in-kind benefits show more variation across CEEs. Enrolment in kindergarten for children aged 3-5 dropped markedly in the Baltic states between 1989 and 1992, and smaller reductions were reported in other countries (UNICEF (1999)). The availability

of child care tended to increase in most CEEs during the years preceding EU accession (see Figure 4). Ten years after the start of the transition, the proportion of children admitted to kindergartens and preparatory schools was over 50 percent and increasing in most CEEs, but still below the average of the old member states (73 percent in 2003). Estonia and Hungary do especially well in providing day care for small children, and Poland stands out at the other extreme, where only one in four children aged 3 go to kindergarten.

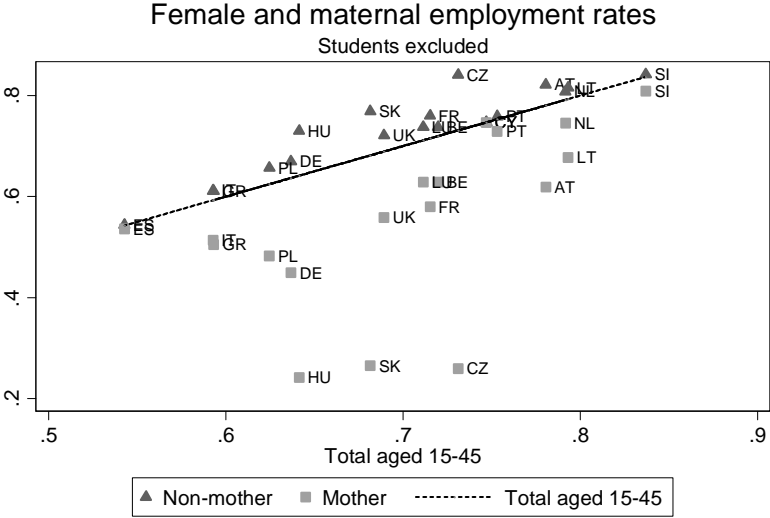
The provision of day care for children under 3 varied considerably across CEEs even during the socialist era, with enrolment rates ranging from 5 % in Poland to over 50 % in East Germany (Moss (1997)). Enrolment rates sharply declined during the transition – with the notable exception of Hungary – and are now rather low compared to the EU-15 average, and especially compared to Nordic countries (Saxonberg and Sirovátka (2006) and OECD (2006)).

4. A country level model of female labour force participation in Europe

Female versus maternal employment

Female employment rates hide substantial variations depending on how maternal status and gainful employment are reconciled in the different parts of Europe. Mediterranean countries have the lowest female employment rates with relatively small differences between the mothers of small children and other women. The gap between female and maternal employment is somewhat larger in Western and Northern Europe including the Baltic states. Three out of the four Central European accession countries for which data are available (Czech Republic, Hungary, Slovakia) appear as *severe outliers* with a gap between 50 and 60 percentage points, and maternal employment rates barely exceeding 25 per cent. Poland also belongs to the low-employment group on both accounts but is located inside the range characteristic of the old EU member states. (Fig 3).

Figure 3.



Source: EU-LFS 2005 q2. 'Mothers' are women aged 15-45 living together with at least one child aged 0-4

In search of an explanation of why the vast majority of Hungarian, Slovakian and Czech mothers stay away from work, the welfare regimes of these countries certainly rate among the prime suspects. The three countries are ranked 1st, 4th and 5th in terms of spending on maternity and parental leave, sharing the leading positions with Scandinavian countries and Finland (OECD Family Database, Table Pf.7.2.). However, while the Nordic states spend generously on

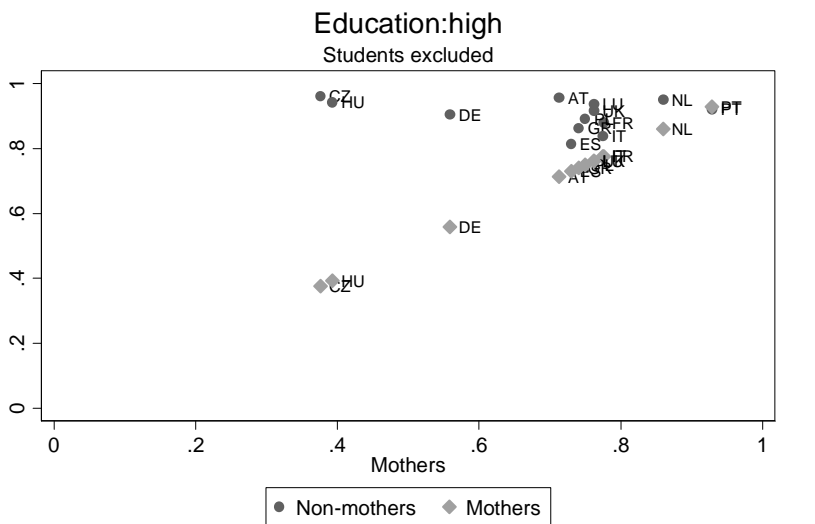
day-care facilities, in the three Central-European countries child-care support is heavily biased in favor of cash benefits (compare op.cit. Pf.7.2. and Pf.11.1).

However, welfare provisions cannot account for all the observed variation in the absolute and relative levels of maternal employment. Reconciling child care and work is easier in large households, in families engaged in farming or running small businesses at or near their homes, while it is more difficult if transport costs are high and part-time jobs are scarce. Further, it is likely that the potential effect of pro-employment policies vary across countries and level of education, as discussed in the next point.

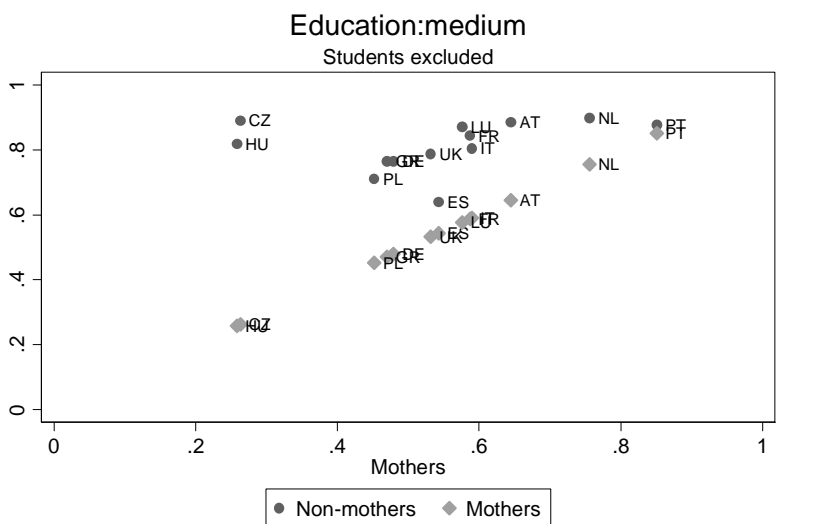
Female and maternal employment by education

High-educated women who do not have small children are almost fully employed in both Western and Eastern Europe while in Greece, Italy and Spain their employment rates are about 80 per cent.

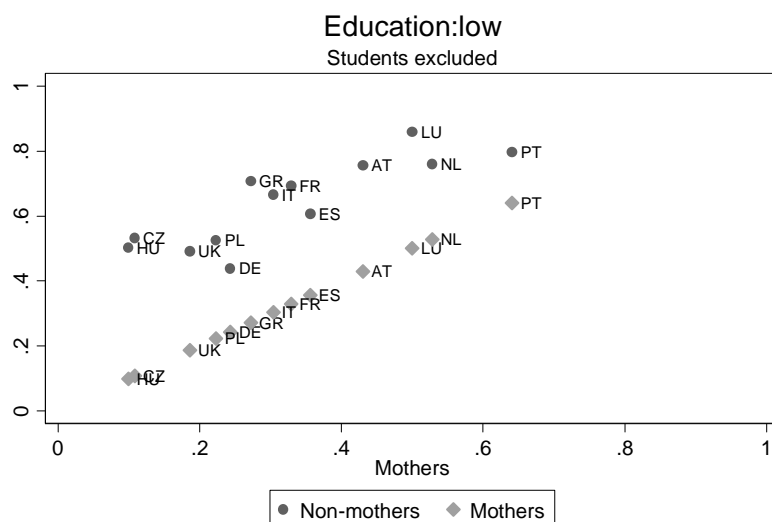
Figure 4.



Note: On the horizontal axis, countries are ordered by mothers' employment rate. Source: EU-LFS, 2005 q2



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While the maternal employment rates vary in a wide range between 30 and 90 per cent at this educational level, the rates of the high-educated non-mothers average to 90.5 per cent with a coefficient of variation of only 0.051. The picture is fairly similar with women having medium-level educational attainment, with a mean amounting to 81.1 and a CV of 0.096.

In the case of low-educated women the patterns are strikingly dissimilar: the employment rates of mothers and non-mothers are strongly correlated within countries. There clearly are some common country-specific factors promoting or restraining the employment of all low-skilled women, irrespective of whether or not they have children. Such factors may include a variety of institutional and structural arrangements such as technologies, the share of self-employment and family-run businesses, general welfare provisions and the minimum wage. (Fig 4). The average employment rate of unskilled women is 64 per cent with a CV of 0.13. While the rates of skilled mothers and non-mothers are not significantly correlated (the coefficients are -0.29 and 0.27 with significance levels of 0.32 and 0.30 for college graduates and high-school graduates, respectively) the two employment levels are very strongly correlated in the case of low-educated women ($r=0.85$ significant at the 0.0001 level).

An important implication of the patterns arising in Figure 4 is that the potential impact of proactive support (via day-care institutions or benefits for working mothers) on labour force participation should vary with (i) the level of education (ii) the level of female unskilled employment and therefore (iii) by countries. The effectiveness of programmes raising the value of work relative to the value of staying at home can be largely reduced if the expected gain from entering the labour market is limited by a low probability of finding a job.

Modelling mothers' employment by level of education: data and methods

Our analysis will build on Scharle (2007), already mentioned in the literature review. This paper estimated the effect of welfare provisions and labour market characteristics on pooled cross sections of thirteen old EU member states and eight new member states, for ten years between 1995 and 2004.⁴ The model was estimated using OLS regression methods and included variables to capture the effects of changes in the labour market, the welfare system, and demographic factors. Lagged values of selected variables were used to overcome potential

⁴ Two old member states (Luxembourg and Belgium) were excluded for the lack of some variables and two new member states (Malta and Cyprus) were excluded both on account of their different past and missing data.

endogeneity problems. The analysis included only 39 observations for the new and 128 observations for the old member states. The dependent variable was the ratio of the female participation rate over the male participation rate for the population aged 25-49. The estimated model took the following general form:

$$\text{Participation gap}_i = \text{constant} + \delta D_i + \mu M_i + \alpha X_i + \beta Y_i + \gamma Z_i + v_i,$$

where D_i and M_i are dummies for CEEs and Mediterranean countries respectively, X_i represent a set of government spending on cash and in-kind family benefits, Y_i represent labour market conditions (unemployment rates, share of female part time employment and the gender pay gap), and Z_i are basic economic and demographic characteristics (per capita GDP and the birth rate), and v_i is an error term for which standard OLS assumptions are made.

We estimate exactly the same model, except that the left hand side variable is now defined as the motherhood employment gap, i.e. the difference in the employment rate of mothers and women with no children. Mothers are defined as women with at least one child younger than five years living in the same household, and non-mothers are defined as women with no child aged below ten living in the same household. Employment rates were calculated for variously defined age groups using microdata from the Eurostat LFS.⁵ Access to microdata also allows us to distinguish levels of education, so that we can define employment rates for mothers and non-mothers in three groups: basic, secondary and higher education.

This refinement of the left-hand side variable considerably reduces the sample: we now have 22 observations for new member states and 65 for old member states for the years between 1998 and 2005. The range of countries and years are considerably different from the sample used in Scharle (2007): there are two new countries in our sample (Cyprus and Luxembourg) and we lose six countries, including two Nordic states (Finland and Denmark).⁶ The overlap between the two samples is reduced to 16 countries and 56 observations, and most importantly, much of the variation in child care systems is lost with the omission of the Scandinavian observations, which will no doubt affect some of the parameter estimates.

Assuming that old and new member states may differ not only in the level of female participation but also in the response of participation to family policies, the model includes an interaction for these variables with the dummy for CEEs. The income elasticity of labour supply may be higher in poorer CEEs, and this would imply a stronger effect of cash benefits, while in-kind transfers and especially day care services may be less efficiently organized, less flexible, or of poorer quality, which may weaken their positive effect on labour supply. A dummy for Mediterranean countries (Greece, Italy, and Spain) captures traditional attitudes to gender roles in the family.

The gap between male and female wages (expressed in proportion to the average male wage) indicates monetary incentives to work or the opportunity cost of staying home: a larger gap means lower incentives. The proportion of women working part time accounts for the flexibility of available jobs and is expected to increase mothers' participation. Male and female unemployment are included to capture labour market tensions but their interpretation is unclear: while female participation may vary predictably with male and female unemployment (as was expected in the model by Scharle, 2007), it is unclear how these would affect the relative chances of mothers as opposed to non-mothers. Mothers with young children may be less

⁵ We defined the following five age groups: 15-54 as the broadest, 20-44 as the narrowest, and three in-between categories: 15-49, 25-49, and 25-54.

⁶ This is due to data restrictions in the Eurostat LFS: in most countries it includes the codes that identify households but these were not available for Nordic countries, and thus we could not identify mothers with young children.

favoured by employers and may have more difficulty in finding a job at times of high unemployment, but - in countries that provide job protection for mothers - they may be keener to return to work as soon as possible so as not to lose their job.

Along with Apps and Rees (2001) and Jaumotte (2003), cash and in-kind provisions for families are distinguished, assuming that cash benefits reduce the incentive to find paid employment and thus decrease female labour force participation. By contrast, in-kind benefits (which include day care facilities and other services) reduce the cost of formal employment and hence encourage female participation in the labour market. In the model, both are expressed in proportion to national income. Cash benefits include all cash payments in connection with the costs of pregnancy, childbirth and adoption, bringing up children and caring for other family members. In-kind transfers are further divided into (1) day care, which covers public spending on day care facilities for pre-school children, (2) home help, shelter and board provided to children on a permanent basis (not included in the empirical model), and (3) other benefits in-kind, which cover price subsidies and miscellaneous goods and services to families and children (Eurostat (1996): 64). The crude birth rate is included to control for long term demographic trends associated with a change of values and attitudes towards female roles in the family and at the workplace. Finally, the log per capita GDP is included to control for the economic environment.

Estimation results

Results presented in Table 1 are generally in line with the estimates of Scharle (2007) using a similar model. Most importantly, the coefficient estimates on cash benefits and day care provisions appear robust despite the considerable change in the sample and despite the fact that only one Scandinavian country (Sweden) is included.

Cash transfers to families provide a clear disincentive for some women to work. The effect is strongest for women with a secondary education, where a 0.1 % of GDP rise in cash transfers would imply a 7 percentage point drop in the motherhood participation gap (i.e. raise the participation rate of mothers compared to non-mothers) in the CEEs, and a 1 percentage point drop in old member states.⁷ A similar rise in spending on day care would increase female participation by 13.6 % points in new and 1.5 %points in old member states. This implies that a regrouping of spending on cash tranfers to day care provisions will yield the highest rise in employment rates among mothers with secondary education. In the CEE, a slightly higher rise could be expected for mothers with primary education, while the effect would be smaller on higher educated mothers.

⁷ The effect of cash transfers in CEE is the sum of the coefficient of cash transfers and of the coefficient of cash transfers in CEE. The same applies to day care and other in-kind transfers in CEE. Percentage point increases are calculated at the mean. E.g., a practicable increase of 0.1 % in cash benefits reduces female participation by $(0.003+0.006)*92.2=0.8$ percentage points, where 92.2 is the average male participation rate in the CEEs.

Table 1. Mothers' employment rate⁺ by level of education (country level)

	Primary	Secondary	Higher
New member states (CEE)	0.913523	-0.20814	0.09204
	0.116833	0.119601	(0.0764)
Mediterranean countries	-0.17776	-0.43104	-0.0521
	0.074059	0.076939	(0.0524)
Cash transfers to families, % of nominal GDP (lagged)	0.044151	-0.10471	0.020257
	(0.0338)	0.032855	(0.0213)
Cash transfers in CEE (lagged)	-1.05851	-0.55888	-0.53064
	0.089936	0.092727	0.056415
Day care transfers to families, % of nominal GDP (lagged)	0.311391	0.149235	0.153337
	0.054957	0.055948	0.036724
Day care in CEE (lagged)	1.037611	1.210405	1.045887
	0.176263	0.183792	0.114403
Other in kind transfers to families, % of nominal GDP (lagged)	0.23789	-0.19623	0.035716
	0.123785	0.117142	(0.0809)
Other in-kind transfers in CEE (lagged)	0.760283	1.045665	0.429747
	0.240541	0.250898	0.156824
Gender pay gap (lagged)	-0.01077	-0.02826	-0.00594
	0.002592	0.002467	0.001697
Female unemployment rate, 15-74 (lagged)	0.019645	0.023201	0.010246
	0.007461	0.007036	0.005221
Male unemployment rate, 15-74 (lagged)	-0.05092	-0.03006	-0.01147
	0.009623	0.008249	0.006767
Log GDP per capita, PPP basis (lagged)	-0.27532	-0.21351	-0.1949
	0.078937	0.07914	0.049977
Crude birth rate, %	0.003619	-0.03326	0.022127
	(0.01582)	0.016086	0.011203
Constant	3.518679	4.143409	2.688774
	0.703651	0.702373	0.440731
Observations	87	90	87
R-squared	0.79	0.88	0.88

Notes: ⁺Measured as the ratio of mother / non-mother employment rate in the population aged 20-44. Standard errors in second row. All coefficients are significant at 5% except where st error is put in parantheses.

One should also note that the separation of educational subgroups did not eliminate the east-west differential in the parameter estimates, i.e., effects remain stronger for the CEEs. The CEE dummy however is no longer significant for the higher educated group, which suggests that the effect in the pooled data may have mostly come from the unobserved variation in educational composition.

As expected, the effect of in-kind benefits varies considerably depending on the level of education within countries. In earlier estimates without Sweden, for old member states it was only significant for women with secondary education, while for new member states it was high and significant both for secondary and higher educated mothers. This is in line with the above discussed assumption that low educated mothers may be less affected as their probability to find employment is constrained as much by their low skills as the lack of alternative arrangements for child care. With the inclusion of Sweden, the coefficient for primary educated mothers is in fact higher than for the other two groups: this clearly requires further investigations. A plausible explanation for the strong positive coefficient for higher educated women in CEE – but not in old member states might be that the private provision of child care is less developed in the CEE, so that public facilities are important even for those families who could otherwise afford private services as well.

Most of the above effects appeared robust across various specifications of the dependent variable. However, the parameter estimates for the other variables appeared rather unstable across specifications and proved to be sensible to the addition or removal of some variables. This calls for further efforts to increase the sample size and explore the potential sources of this instability. Most importantly, we need to include another Scandinavian country in the sample. An alternative strategy may be to estimate labour force participation using individual level data from the EU LFS where welfare spending is included along with other country-level contextual variables as contextual indicators. This would permit controlling for a variety of factors that affect the participation decision, but the data allow only repeated cross-section or pooled regressions rather than panel estimation: this is explored in the next section.

5. An individual level model of mother's employment

In this section we use an alternative estimation strategy to examine the same problem. We estimate the likelihood of employment for mothers on individual level data of the European Labour Force Survey with country-level welfare variables as crude indicators of available welfare provisions. The advantage over the country panel used in section 4 above is that the individual models permit controlling for a wider range of factors that affect the participation decision, but the data allow only repeated cross-section or pooled regressions rather than panel estimation. Also, there are still some important constraints on the availability of explanatory variables. There is no information on incomes (not even on child benefits), nor on the alternative forms of child care (grand parent, other inactive family member, price of private care arrangements, etc) available to the household.

The data cover sixteen countries and the years between 1998 and 2005, and mothers aged 20-49. Five CEE countries are included, namely Czech Republic, Hungary, Latvia, Lithuania and Slovenia, ten of the EU-15 (excluded Holland, Luxembourg, Finland, France and Sweden) and Cyprus. As in the previous section, the main focus is on the effect of child-care provisions. We estimate logistic regression models where the dependent variable is 1 if the mother is working, for three education groups. The definition of mothers and educational levels are the same as in the county panel. In an alternative specification we also estimate multinomial logit models with four outcomes: inactive, unemployed, part time and full time employment. We expect the effect of in-kind benefits to vary considerably depending on the level of education within countries.

Estimation results

Results are by and large in line with the country level estimates in the previous section (see Table 2 below). Transfers seem to have a small or insignificant effect on mother's employment in the EU-15 while their effect is high and significant in CEE. In the five CEE countries included in the sample, cash transfers reduce the likelihood that the mother works while day care provisions increase it. The latter effect tends to decline with the level of education, possibly due to the fact that the relative value (compared to earnings) of child care provision is smaller for graduates.

Table 2. Mothers' employment rate⁺ by level of education (individual level)

	Pimary	Secondary	Higher
Cash transfers to families, % of nominal GDP	0.074	0.069	-0.016
	0.027**	0.023**	0.041
Cash transfers in CEE	-1.296	-1.370	-1.259
	0.162**	0.063**	0.108**
Day care transfers to families, % of nominal GDP	0.139	-0.014	-0.105
	0.095	0.088	0.105
Day care transfers in CEE	4.743	4.440	3.208
	0.672**	0.241**	0.397**
Other in kind transfers to families, % of nominal GDP	0.657	1.011	1.636
	0.152**	0.179**	0.266**
Other in-kind transfers in CEE	0.667	0.208	-0.718
	0.571	0.269	0.442
Age	0.021	0.047	0.052
	0.002**	0.002**	0.003**
Number of children aged 0-4	-0.662	-0.692	-0.519
	0.029**	0.020**	0.025**
Number of children aged 5-14	-0.276	-0.260	-0.126
	0.013**	0.011**	0.017**
Rural	-0.005	-0.105	0.029
	0.026	0.020**	0.027
Urban	-0.011	-0.046	0.018
	0.026	0.022*	0.032
No partner	-0.069	-0.237	0.037
	0.032*	0.023**	0.043
Partner unemployed	-0.482	-0.468	-0.284
	0.049**	0.048**	0.079**
Partner inactive	-0.670	-0.459	-0.002
	0.059**	0.053**	0.084
Employment rate of non-mothers aged 20-49	3.359	1.524	2.085
	0.188**	0.166**	0.328**
Pay gap	-0.028	-0.028	-0.035
	0.003**	0.002**	0.003**
Crude birth rate	0.079	0.158	0.124
	0.016**	0.011**	0.020**
Log GDP per capita, PPP basis	+0.000	+0.000	+0.000
	0.000**	0.000**	0.000**
Constant	-1.675	-1.430	-1.482
	0.190**	0.152**	0.244**

Age and number of young children in the family is quite understandably the most powerful predictor of mothers' employment. Family responsibilities of women tend to increase with the number of children in the household and decrease with their age. Unfortunately there is no precise information available about the age of the youngest child in the family, so instead we use the number of children in the age group 0-4 as an indicator, and also the number of children between 5 and 14 years. The former can also be interpreted as a proxy of the age of the youngest child: if there is more than one child under 5 in the family it is very likely that some of them belong to the youngest ones within this age-group. Indeed, our models show that the number of children below 4 is an important predictor of mother's labour market inactivity at each educational level: the more children they have in this age-group, the less likely they are either to work or seek employment. This pattern is slightly less marked among higher education graduates for whom there is a higher cost of inactivity that makes them return to work sooner

after child birth. As expected, the number of older children has a weaker but significant effect in the same direction.

The higher the mother's age the more likely she is to work, either part time or fulltime, and increasingly so as we move from the primary educated to the highly educated. At the same time, the likelihood of inactivity, as well as the risk of unemployment decreases with age. These findings are consistent with the predictions of human capital theory: accumulated human capital is increasing with age and older women therefore have more to lose if they stay away from the labour market.

We find that single mothers and also mothers whose partner is either inactive or unemployed are less likely to work than those who have an employed partner living with them. As we can see from our second set of models this points to the high probability of these women being unemployed, rather than them choosing to stay away from work. Although not less likely to work than others, mothers with higher education who are either single or have an inactive partner are also at a greater risk of unemployment than their counterparts. If working however, single mothers tend to work fulltime rather than part-time.

6. Summary and conclusions

Although the analysis was constrained by lack of data, results confirm earlier estimates using a rougher measure of labour supply and also lead to more precise conclusions concerning education specific effects. In the country level data we find that day care services are more likely to help increase participation for mothers with no education, while cash transfers have a strong negative effect on their probability of employment, at least in the CEE. By contrast, higher educated mothers are less discouraged by cash transfers than their less educated peers and are practically not affected by the availability of day care services – except in transition countries. A conversion of cash transfers into day care provision would yield the highest rise in employment rates among mothers with secondary education, where both effects are strong, and especially so in CEE.

The effects in the individual level data are less clear as there is no information on transfers available to the individual – we use the country level aggregates as context variables instead. In transition countries, the effects are strong, significant and of the same sign as in the country level estimates. However, in contrast to the country level estimates, mothers with primary education seem to benefit equally or more than their better educated peers from child care provision in transition countries.

Data limitations appear to be a serious concern in both country level and individual level estimates. The first may be remedied in two ways: either by obtaining access to national LFS data which would in most cases have the necessary detail for our analysis (but which is omitted from the Eurostat version), or by giving up on the more refined definition of the dependent variable and using instead the female employment rate for the three educational groups.

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Appendix

Table A1. Summary statistics of country panel

	Mean	Std. Dev.	Min	Max
<i>Primary (83 obs)</i>				
Mother's employment gap (aged 20-44)	0.62	0.22	0.19	1.18
CEE	0.27	0.44	0.00	1.00
Cash benefits	1.37	0.76	0.28	3.30
Cash benefits in CEE	0.36	0.63	0.00	2.05
Day care	0.19	0.18	0.00	0.59
Day care in CEE	0.04	0.12	0.00	0.59
Other in-kind benefits	0.26	0.15	0.03	0.55
Other in-kind benefits in CEE	0.11	0.21	0.00	0.64
Pay gap	15.96	5.48	6.00	26.00
Female unemployment	8.35	4.37	2.11	22.81
Male unemployment	6.23	2.87	1.59	14.79
Log GDP per capita, PPP basis	9.90	0.42	9.04	10.99
Crude birth rate	10.53	1.36	8.32	13.12
Proportion of women working part time, %	25.22	18.53	4.79	75.12
<i>Secondary (84 obs)</i>				
Mother's employment gap (aged 20-44)	0.87	0.30	0.32	1.67
CEE	0.27	0.45	0.00	1.00
Cash benefits	1.36	0.76	0.28	3.30
Cash benefits in CEE	0.38	0.66	0.00	2.05
Day care	0.20	0.18	0.00	0.59
Day care in CEE	0.04	0.12	0.00	0.59
Other in-kind benefits	0.26	0.15	0.03	0.55
Other in-kind benefits in CEE	0.12	0.22	0.00	0.65
Pay gap	15.95	5.46	5.00	26.00
Female unemployment	8.39	4.58	2.11	22.81
Male unemployment	6.35	3.17	1.59	19.56
Log GDP per capita, PPP basis	9.88	0.42	9.01	10.91
Crude birth rate	10.49	1.36	8.32	13.12
Proportion of women working part time, %	24.39	18.54	4.79	75.12
<i>Higher (84 observations)</i>				
Mother's employment gap (aged 20-44)	0.88	0.20	0.38	1.13
CEE	0.27	0.45	0.00	1.00
Cash benefits	1.37	0.74	0.28	3.30
Cash benefits in CEE	0.38	0.66	0.00	2.05
Day care	0.20	0.17	0.00	0.59
Day care in CEE	0.04	0.13	0.00	0.59
Other in-kind benefits	0.27	0.14	0.03	0.55
Other in-kind benefits in CEE	0.12	0.22	0.00	0.65
Pay gap	15.39	5.45	5.00	26.00
Female unemployment	8.49	4.49	2.11	26.62
Male unemployment	6.38	2.80	1.59	14.61
Log GDP per capita, PPP basis	9.87	0.42	8.95	10.99
Crude birth rate	10.46	1.31	8.32	13.12
Proportion of women working part time, %	24.63	18.58	4.79	75.12

Table A1. Summary statistics of individual repeated cross-sections

	Primary	Secondary	Higher
Employed	0.311	0.412	0.606
Pay gap	14.692	17.426	16.506
Crude birth rate	10.281	10.299	10.449
GDP per capita, PPP basis	19399	20602	20906
Cash transfers to families, % of nominal GDP	0.894	1.364	1.079
Cash transfers in CEE	0.165	0.357	0.144
Day care transfers to families, % of nominal GDP	0.264	0.200	0.241
Day care transfers in CEE	0.008	0.015	0.008
Other in kind transfers to families, % of nominal GDP	0.262	0.262	0.247
Other in-kind transfers in CEE	0.044	0.084	0.036
Age	31.199	31.050	33.886
Number of children aged 0-4	1.183	1.185	1.223
Number of children aged 5-14	0.755	0.562	0.482
Rural	0.382	0.459	0.544
Urban	0.338	0.280	0.216
No partner	0.145	0.159	0.073
Partner unemployed	0.061	0.031	0.018
Partner inactive	0.052	0.026	0.017
Employment rate of non-mothers aged 20-49	0.547	0.703	0.816
N	52178	75876	38700