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Household and Regional Socio-Economic Characteristics: Do They Affect the Use of Childcare in Italy?

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1. Introduction

In comparison to other European countries, such as Northern Europe and the UK, the debate about fertility, female employment and family-work reconciliation has gained appeal relatively late in Italy. As in other southern European countries, in Italy the increase in female labour force participation has been limited, or at least not as remarkable as, e.g., in Sweden, France and the UK. In 2006 the female employment rate was 46.3 per cent (age 15-64) versus 70.7 in Sweeden, 57.7 in France and 65.8 in UK. There is also an appreciable regional heterogeneity: northern Italian regions show higher labour force participation than the southern ones. In spite of a limited increase of female employment, fertility has faced a considerable decline in Italy, drawing attention of the scientific community.

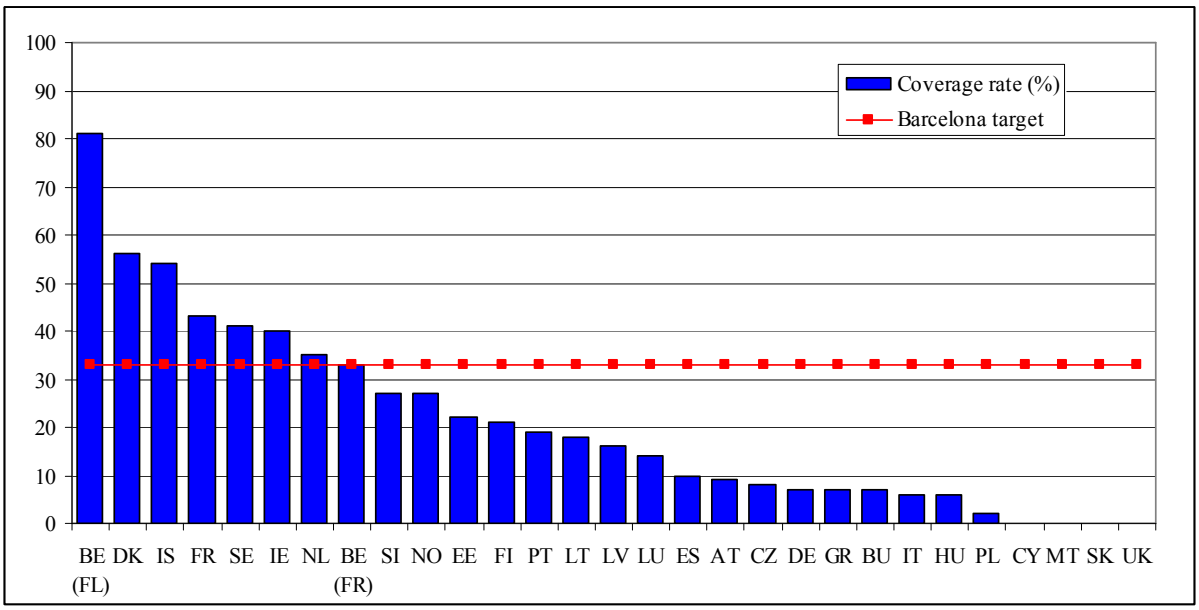
Even though the existence of an inverse relationship between fertility and employment has been noticed since the 1970s (e.g. Becker and Lewis, 1973; Mincer, 1985), recent studies analysing western European data have shown that in the mid 1980s the cross-country correlation turned from negative to positive. Currently, countries with the lowest fertility levels (i.e. Italy and Spain) are countries which register relatively low female participation rates, while countries with higher fertility are those with also a higher female labour force participation rate. Different studies (Brewster and Rindfuss, 2000; Ahn and Mira, 2002; Billari and Kohler, 2004) analysed empirically the cross-country correlation between female labour force participation and fertility. The inversion of the correlation has to be sought mainly in the changes in the social attitude towards working mothers, the set-up of policies aiming at reconciling work and childbearing, the availability of parental leaves, etc. Other studies, pooling cross-country and time series data, state that the sign of the correlation has not changed but weakened over time (Engelhardt and Prskawetz, 2002 and 2005). It turned out that in southern Europe the correlation between fertility and female employment is still significantly negative. Northern Europe seems to be more successful in promoting women's participation in the labour market without severely hampering fertility desires. Conversely, in southern Europe the growth of female labour force participation, greater opportunity-costs for mothers to take care of their young children on a full-time basis, the rigidity of the labour market, greater economic uncertainty for young couples, seem to determine significantly the gap between realized and desired number of children. Therefore, these aspects should be taken seriously into account in the drawing up of friendlier family policies.

Focusing on the relation between fertility and female employment and more precisely on policies aiming at reconciling work and family, the provision of childcare services plays an

important role. This is confirmed also by the guidelines of the European Council provided in Barcelona in 2003. The target for the Member States should be to provide childcare by 2010 to at least 90 per cent of children between age 3 and mandatory school age and to at least 33 per cent of children under 3 years of age. The aim is to raise women's labour force participation and contribute to full employment.

In most European countries public childcare for children aged 3-5 is well developed. In Italy it is used by 95 per cent of children. As for early childhood, only a few countries have already reached the target of childcare provision (Figure 1). In Italy the estimated coverage rate is of 6 per cent. The number of available places in nurseries covers about 7 per cent of children below age 3. Both public and private childcare availability for these children is characterized by heterogeneity across regions. Unlike for the private one, the access to public childcare depends on family size, composition as well as economic characteristics and is highly subsidized. Private childcare is less widespread than the public one, its cost is much higher and might represent a significant economic burden for families. Moreover, together with availability, childcare use depends on the hours of care offered, which of course, affect the opportunity-costs for mothers. As a result, the taking care of young children is still largely delegated to families (e.g. grand-parents or other relatives, baby-sitters, other forms of self-organized childcare), compromising, among others, an easier reconciliation between work and family.

Figure 1 – Recalculated and harmonised childcare coverage rate (0-3 years)



Note: * Czech Republic figure only for pre-school
Source: Plantenga and Siegel (2004); Plantenga and Remery (2005)

In this paper we focus on childcare use across Italian regions. We investigate the relationship between the use of childcare (separately formal and informal[1]), family socio-economic characteristics and regional differences regarding formal childcare availability and labour market characteristics. In particular, we explore the importance of different factors at household level, such as parents' personal characteristics, household composition and income, and regional level regarding childcare supply, costs and employment. The aim is to disentangle the variability of the phenomenon due to household and regional level heterogeneity and to see whether and how these household and regional components are associated with formal and informal childcare choices. We use Italian 2004 EU-SILC data.

The paper is structured as follows. In Section 2 we present some previous results regarding childcare use. In Section 3 we outline some characteristics of the Italian childcare system. In Section 4 we present the data and method. Section 5 contains the results of our model. Section 6 provides the concluding remarks.

2. Childcare use: some previous evidence

In the economic literature there are several examples of trying to estimate the effect of changes in income, wage rate and the price of childcare on family decisions. Focusing on childcare choices, the most attention has drawn the relationship between childcare characteristics and women's labour force participation. In the U.S, Canada and the UK studies have mainly focused on the effect of childcare costs on employment decisions, and on the choice between private and informal childcare (e.g. Heckman, 1974; Blau and Robins, 1988; Ribar, 1992; Viitanen, 2005; Powell, 1997; Blau and Robins, 1998; Duncan et al., 2001; Michalopoulos and Robins, 2002; Joesch and Hiedemann, 2002; Kuhlthau and Mason, 1996; Johansen et al., 1996). Most of these studies show that there is a negative effect of childcare costs and a positive effect of childcare availability on mother's employment and childcare use. However, as pointed out in Del Boca et al. (2004), these studies rely on the hypothesis that there is a well functioning market system where childcare can be purchased by parents as a normal good and where childcare supply reacts to changes in childcare demand. This seems not to be the case in many European countries, though.

An interesting comparison of childcare systems in the EU-15 member countries is found in De Henau et al. (2007). Their results support the idea that the factors influencing the

[1] Day-nursery is defined as formal childcare. Informal childcare is unpaid care provided by grand-parents, other relatives, friends, etc.

functioning of the childcare system in most of the European countries are somehow different from those which regulate a market system, with a peculiar impact on both the supply and demand.

According to De Henau et al. (2007) countries differ in early childhood care provision, first, because of diverging opinions on the optimal age at which children should start socialisation, and second, as to the sharing of childcare responsibilities, i.e. considering the child an exclusively private matter or rather a public good. If governments help parents in sustaining the cost of the children, the state intervention can act through the provision of public childcare services, generous parental leaves or direct financial support. This reflects differences in the idea of how early childcare should be provided: by public services, within the family sphere or by private services. De Henau et al. (2007) combine three childcare indicators to evaluate the degree of coverage of the childcare system in the EU-15 Member States: public or publicly funded childcare availability; childcare daily opening hours; public share of costs. Regarding public childcare availability, low figures are observed in Anglo-Saxon countries, where childcare is mainly provided by the private sector (and thus closer to the market system logic), in Mediterranean countries with high family support, and in countries like Austria and Germany, where the traditional division of roles is rather institutionalised and mothers are responsible for the socialisation of children. The northern European countries and France offer the most generous provision of public childcare accompanied also by favourable parental leave schemes. It might not be just a case that these countries register the highest fertility rates and female labour force participation in Europe. Considering the second indicator, i.e. the daily opening hours, only in Portugal, Austria and Spain childcare facilities are open less than 8 hours and, thus, do not cover completely a working day. As to the third indicator, in half of the Member States the funding amounts to more than 80 per cent of childcare costs. In the final ranking Denmark, Sweden, France, Belgium and Finland are in the upper part with scores above the 15 per cent; Germany, Portugal, Austria and Italy are in the middle with lower scores between 4 and 6 per cent; the last six countries (Spain, Luxembourg, Greece, Ireland, Netherlands and the UK) show scores below 2 per cent. For most countries childcare availability determines the level of the final score, because both public funding and opening hours are quite high in most of the countries or compensate for each other (e.g. Denmark and the UK).

Thus, in European countries childcare availability, rather than its costs, may be considered as the principal characteristic determining childcare use and consequently linked to women's labour force participation. This seems to be particularly true in countries where

public childcare prevails. In this case it is usually also highly subsidized, with long opening hours and of high quality, all factors that should attract families to use formal childcare.

Chevalier and Viitanen (2001) findings from the analysis of European data support "*the claim that women's participation is constrained by the lack of childcare facilities and that the supply of childcare is, in fact, inelastic*" (Del Boca et al. (2004) p. 6). Childcare availability, or rather the rationing of the childcare supply, is stressed in various studies as one of the explanations to the limited use of public childcare. Gustaffson and Stafford (1992) show for Sweden that in regions where childcare availability does not seem to be rationed, there is a negative effect of the childcare costs on mother's labour market participation and on the public childcare use; in regions with more severe rationing the effect of childcare cost is limited. Focusing on German data, Kreynfeld and Hank (2000) argue that an analysis of the effects of childcare on the employment of mothers in Germany should focus on the availability rather than the affordability of care. They estimate the impact of having access to (formal and informal) day-care arrangements on the mother's employment status. They find no significant effect of the provision of public day-care on female labour force participation, while private childcare has not developed in Germany and its effect is thus negligible. Therefore, it is likely that "a substantial number of working women relies on patchwork childcare arrangements" (Kreynfeld and Hank 2000, p. 332). Their results cast doubts on the effectiveness of the current German day-care regime as regards its ability to enable mothers to participate in the labour market. For Italy the rationing hypothesis has been considered in Del Boca (2002), Del Boca and Vuri (2006) and Del Boca et al. (2004). The empirical results confirm that rationing, both of public and private childcare, has to be taken into account when analysing price effects on childcare use and it is *per se* an important factor affecting families' choices in Italy.

Besides the rationing hypothesis for childcare use, family preferences can also be accounted for as an explanation of limited childcare use. The traditional gender roles, according to which mothers are seen as the primary caregivers for very young children, stronger family ties and prompt family support may hamper the demand for formal childcare. Informal childcare, i.e. help provided by relatives, complements but often substitutes for formal childcare, either because it is anyway considered better for very young children to be looked after within the family, or because of the lack of formal childcare alternatives.

To conclude, women's participation in the labour market and childcare use are heavily intertwined. Besides household's preferences and characteristics, empirical results for European countries show that, especially where public childcare prevails, childcare

availability is as important as childcare costs in influencing household choices for using formal childcare arrangements and mothers employment. In northern European countries with a more gender-equal public policy, both parents are provided with more generous parental leaves and formal childcare is a legal right for every child (De Henau et al. 2007). Despite the recognition of the child as a public good and the state intervention in childcare provision, in southern Europe the (although limited) increase in women's labour force participation has not been accompanied with an adequate support in childcare supply. This has dangerously challenged the possibility of mothers, the primary caregivers, to successfully reconcile work and family.

3. Formal childcare for children under 3 years old in Italy

The setting-up of formal childcare for children below the age of 3 dates back to the beginning of the 1970s (national law 1044/71). According to the national laws regarding policies for early childhood, the Municipality is the main actor in the childcare system organization. The State is only responsible for giving guidelines and funding, while Regions decide about local planning (building, management and control of services) and allocation of funding. Most of the regulations related to childcare are taken at regional level.

After its institution, formal childcare has further developed and undergone important changes, such as the recognition of its educational role, especially since the 1980s. Consequently, the discussion about the advantages and drawbacks of using formal childcare for very young children was replaced by the discussion about how to increase the number of nurseries, improve their quality and offer additional integrative childcare services. Therefore, during the last fifteen years new typologies of formal childcare have emerged, indicating the intuition of the potential needs of families for complementary solutions. Moreover, the advancement of the private sector has been noticed, working mainly in agreement with the public sector.

Nowadays the formal childcare system for children less than 3 years old includes the day-nursery and micro-nursery, the integrative services (playgroups, centres for children and parents, professional child-minders at child's or child-minder's home)[2] and innovative services (e.g. integrated nursery, family nursery)[3]. The organisation of integrative and innovative childcare services reflects an increasing attention towards different family and children needs.

[2] Spazi gioco, centri per bambini e famiglie, servizi educativi domiciliari.
[3] Nido integrato e nido famiglia.

A survey carried out in 2000 by the "Centro nazionale di documentazione e analisi per l'infanzia e l'adolescenza" (Istituto degli Innocenti, 2002) counted 2404 public nurseries in Italy, to which at least 604 private services[4] should be added (Table 1). Moreover, there were 504 complementary services of public nature, while the private ones were at least 228. According to a new survey in 2004 (Istituto degli Innocenti, 2006), referring to the last available information given by the Municipalities and Provinces, the number of nurseries increased to 4885, of which 38.9 per cent were private. The number of complementary childcare services rose to 2491.

Focusing only on nurseries, the regional distribution of services was not even, with a clear asymmetry in favour of the northern-central regions. In 2000 almost 85 per cent of public nurseries were in the North-Centre[5] and about 82 per cent of the private ones, even though Campania, Puglia and Calabria registered a noticeable percentage of the latter. Within the regions public nurseries prevailed. There are, however, some exceptions, like the Province of Bolzano, Veneto, Campania and Calabria with a considerable portion of private childcare.

Table 1 – Distribution of public and private nurseries across Italian regions (row and column percentages)

Regions	Public nurseries (% within region)	Public nurseries (% Public)	Private nurseries (% within region)	Private nurseries (% Private)	N. nurseries
Piemonte	78.6	8.1	21.4	8.8	248
Valle d'Aosta	100.0	0.5	0.0	0.0	11
Lombardia	84.3	19.9	15.7	14.7	567
Province of Bolzano	56.3	0.4	43.8	1.2	16
Province of Trento	78.7	1.5	21.3	1.7	47
Veneto	47.8	6.4	52.2	27.8	322
Friuli-Venezia Giulia	68.4	1.6	31.6	3.0	57
Liguria	87.8	3.6	12.2	2.0	98
Emilia-Romagna	91.3	15.3	8.7	5.8	403
Toscana	92.9	9.8	7.1	3.0	253
Umbria	87.9	2.4	12.1	1.3	66
Marche	77.5	4.5	22.5	5.1	138
Lazio	83.1	8.8	16.9	7.1	255
Abruzzo	92.9	1.6	7.1	0.5	42

[4] The survey underestimates the number of private services. Many private services are missing registration by the Municipalities that participated in the survey.

[5] The "North" of Italy is represented by Piemonte, Valle d'Aosta, Lombardia, Trentino Alto Adige (i.e. Provinces of Trento and Bolzano), Veneto, Friuli-Venezia Giulia, Liguria, Emilia Romagna; the "Centre" by Toscana, Umbria, Marche, Lazio; the "South" by Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia and Sardegna.

Molise	80.0	0.2	20.0	0.2	5
Campania	47.1	2.0	52.9	8.9	102
Puglia	69.9	2.1	30.1	3.6	73
Basilicata	82.1	1.0	17.9	0.8	28
Calabria	55.0	0.9	45.0	3.0	40
Sicilia	100.0	7.2	n.a.	n.a.	172
Sardegna	86.2	2.3	13.8	1.5	65
Total	79.9	100.0	20.1	100.0	100.0
N. nurseries	2404		604		3008

In 2000 the overall supply of nursery places was 7.4 per 100 resident population below age 3, of which 6.5 were public (Table 2). The data collected in 2004 show an increase in the overall supply up to 9.9 places per 100 children. Both figures are clearly still far away from the Barcelona target of a coverage rate of 33 per cent of children under the age of 3[6]. There are clear differences across regions regarding the incidence of available public childcare places (Figure 2). In 2000 northern-central regions were generally above the national figures. In particular, in Emilia-Romagna the level was threefold and in Valle d'Aosta double. The South was characterised by lower levels, the lowest registered in Campania and Calabria (around 1 per cent). It is interesting to note that a higher number of nurseries does not necessarily correspond to a higher incidence rate of available places. Emilia-Romagna is the second region in terms of the number of nurseries, but the leader in terms of the incidence of available places. Conversely, Lombardia shows the higher amount of nurseries, but deserves only the eighth place as for the incidence rate. Follow Valle d'Aosta and the Province of Trento, which register a limited number of services, but a high incidence rate (12.3 and 11 per cent respectively).

To such a scarce childcare supply corresponds nevertheless a similarly poor demand. In 2000 there were overall 9.9 applications for nursery services per 100 children, of which 9 for public nurseries (Table 2). Regional diversity emerges again (Figure 2). The North-Centre (apart from Veneto and the Province of Bolzano) was characterised by a higher incidence of applications. Valle d'Aosta and Emilia-Romagna were on the top of the ranking with about 21 applications per 100 children, while Calabria was at the bottom with about 1 per cent. These results confirm that supply goes hand in hand with demand: regions with higher incidence of place availability have to face also a higher incidence of applications.

[6] Barcelona European Council, March 2002, *Presidency Conclusions*, available online at: http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/71025.pdf

Table 2 – Supply and demand of formal childcare services across Italian regions per 100 children less than 3 years old, year 2000

	Public and private nurseries		**Only public nurseries**			
Regions	Nursery places on population below age 3	Nursery applications on population below age 3	Nursery places	Nursery applications	Nursery places on population below age 3	Nursery applications on population below age 3
Piemonte	10.7	13.1	10021	12238	9.7	11.8
Valle d'Aosta	12.3	21.9	390	691	12.3	21.9
Lombardia	9.7	12.9	21629	28996	8.9	11.9
Trentino-Alto Adige	7.5	9.2			6.7	8.5
Veneto	7.2	10.7	6842	10262	5.5	8.3
Friuli-Venezia Giulia	7.8	11.5	1637	2512	6.1	9.4
Liguria	9.7	21	3064	6821	9.3	20.6
Emilia-Romagna	18.3	22.1	16287	19789	17.4	21.1
Toscana	11.3	16.6	8618	12880	10.7	15.9
Umbria	11.6	15.2	2078	2783	10.6	14.2
Marche	11.5	15.1	3521	4984	9.7	13.7
Lazio	8.2	12.2	10906	16627	7.5	11.4
Abruzzo	4.1	4.5	1265	1405	3.8	4.3
Molise	2.9	2.6	212	167	2.5	2
Campania	2.2	2.5	2040	3216	1	1.6
Puglia	2.7	2.9	2624	3253	2.1	2.5
Basilicata	5.2	5.6	739	845	4.4	5
Calabria	1.9	1.8	670	783	1.1	1.3
Sicilia	4.7	5.9	7773	9775	4.7	5.9
Sardegna	6.4	8.2	2310	3093	5.7	7.6
Total	***7.4***	***9.9***	***104742***	***143691***	***6.5***	***9***

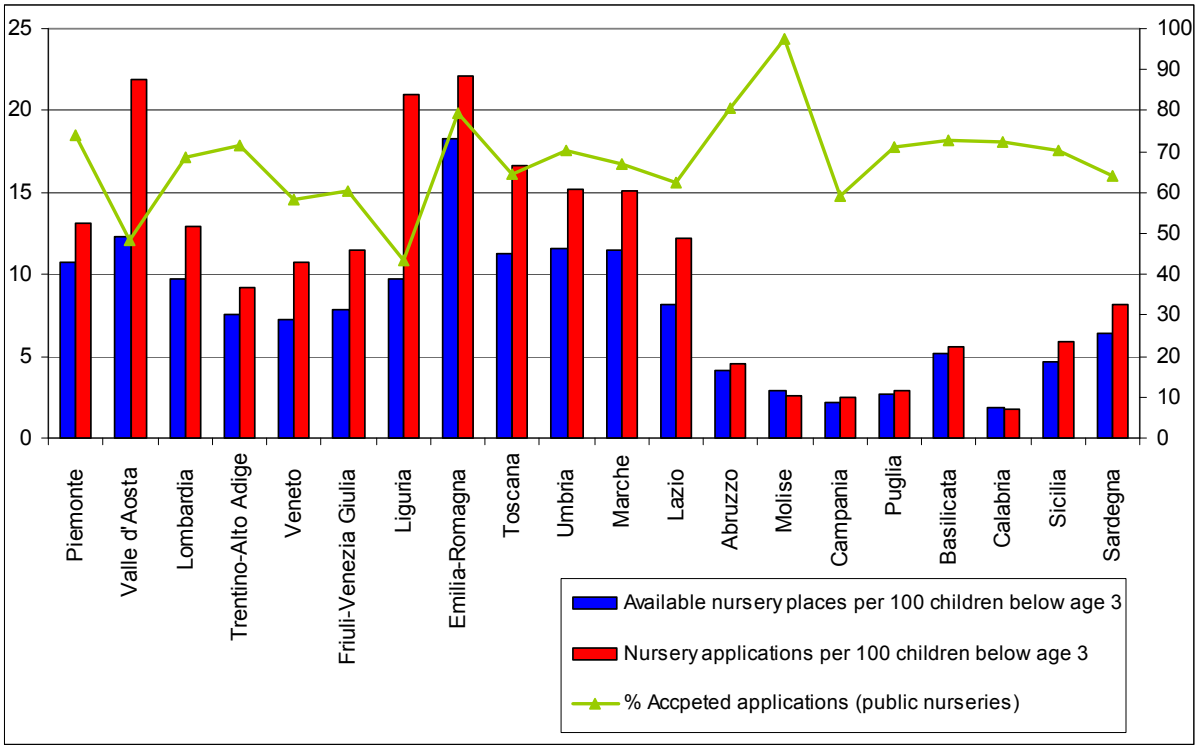
Source: Isituto degli Innocenti (2002).

How do regions actually face the demand for formal childcare, in particular nursery? At the national level, considering both public and private nurseries, the difference between the demand and supply is of 2.5 per 100 children less than 3 years old. Thus, 75 per cent of those who applied might have access to the nursery. Public nurseries could cover 66 per cent of the applications. Ten regions show figures above the national level. The highest are found in Liguria (a gap of 11.3 per cent) and Valle d'Aosta (a gap of 9.6 per cent). Considering the regional heterogeneity, higher demand is registered in regions with higher supply. Moreover, larger differences between demand and supply, and longer waiting lists, always expressed in terms of children below age 3, are also to be found in these regions (Figure 3). This suggests that we are rather far from a sort of equilibrium between demand and supply (Istituto degli

Innocenti, 2006, p.18) and that an increase in supply actually triggers an increase in demand. According to some local evidence, the equilibrium is reached when the supply is about 50-60 per cent of the reference population (i.e. children aged below age 3) (Istituto degli Innocenti, 2006).

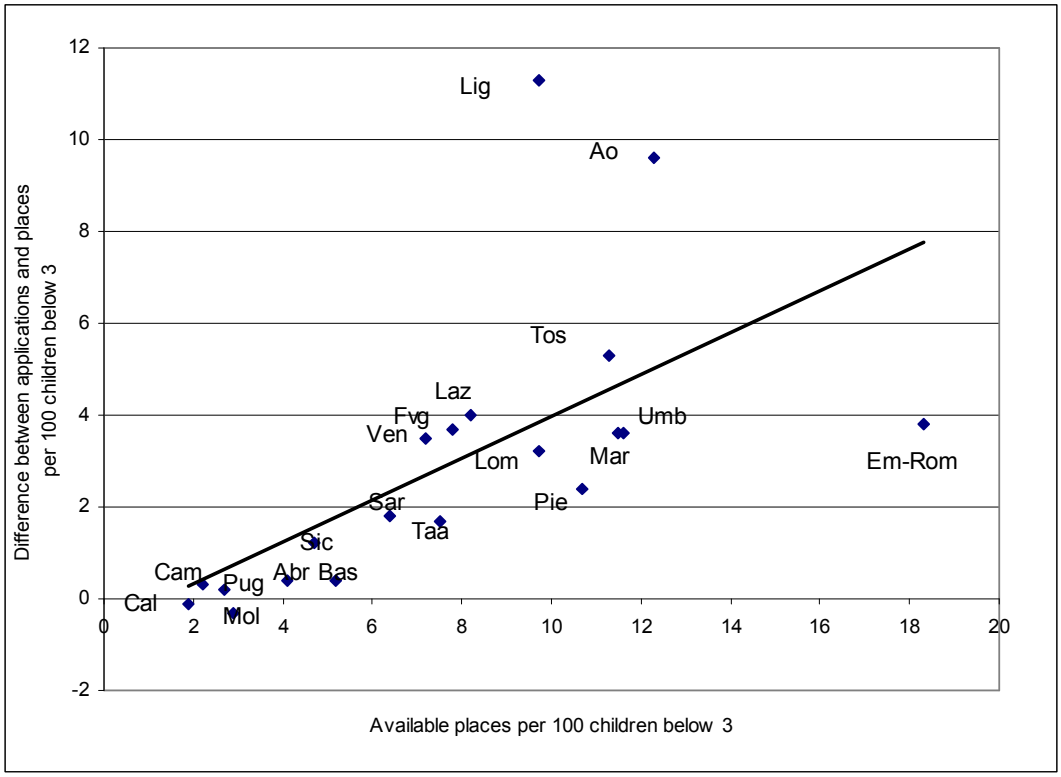
Considering only the public sector, in 2000 about 67 per cent of applications were accepted and about 33 per cent were included in the waiting lists. This result confirms that there is a noticeable part of the demand which fails to be satisfied, even though with some regional variability. Valle d'Aosta and Liguria were not able to cover not even half of the applications to public nurseries. Veneto, Liguria, Lazio, Campania and Sardegna are also below the national level. The majority of regions range between 60 and 80 per cent. Emilia-Romagna is leading among the regions with high supply and demand with 79 per cent of accepted applications.

Figure 2 – Childcare availability, demand and accepted applications by region (%), year 2000



Source: Isituto degli Innocenti (2002).

Figure 3 – Nursery places versus the difference between nursery places and applications, per 100 children below age 3



Source: Isituto degli Innocenti (2002).

Besides service availability, economic costs of childcare for children under 3 also influence the demand for such services. For public services, the share of expenses to be covered by families is established by each Municipality, and should cover at least 50 per cent (Toto 2007). Public childcare fees depend on the size, income and composition of the family. Private and public childcare costs vary noticeably across regions, with higher fees in the North of Italy (Toto 2007). However, since in some northern regions private supply represents about a half of childcare services, unaffordability may seriously compromise the use of formal childcare, despite lower public childcare costs.

The number of months, along which nurseries are open, is also an important issue addressed within the family-work reconciliation discussions. In 2000 the majority of nurseries in Italy guaranteed access between 40 and 44 weeks per year and about 30 per cent between 45 and 48 weeks (Isituto degli Innocenti 2002). About 36 per cent of private nurseries offered more than 45 weeks of opening period. In general, this is far more than what available for higher levels of schooling and in line with the purposes of the early childcare provision. Moreover, there are no appreciable differences between regions. Regarding daily opening hours, most nurseries were open between 9 and 10 hours a day, usually for five days a week. The distribution across regions was rather uniform. Private services offered a somewhat larger time span of opening hours.

To conclude, there seem to be two important critical points to be stressed regarding the childcare system in Italy. First, both supply and demand are scarce when compared to the population eligible to use childcare services. The poor demand for day-nursery might be related to different arguments, such as cultural factors, lack of information, presence of alternative solutions, costs, etc. Second, the supply is anyway not able to fully satisfy the demand for formal childcare. The gap widens in regions with higher incidence of available places and applications per 100 children less than 3 years old. This structural deficiency might as well hamper the real expression of needs by families, who might *a priori* prefer to look for other solutions. Even though increasing, private childcare services can to date only marginally contribute to fill in the gap between supply and demand. Opening periods during the year and daily opening hours seem to correspond to the needs of full-time employed parents, even though more flexibility in opening hours has often been pointed at as a necessary requirement. Complementary formal childcare services might play such a role with a lower number of opening hours per day but greater flexibility.

4. Data and method

4.1. The EU-SILC database

The EU-SILC (EU-Statistics on Income and Living Conditions) represents a new source of information for studying income, poverty, social exclusion and living conditions at EU level. It has been thought to replace the ECHP (European Community Household Panel) which expired in 2001. The EU-SILC was launched in 2004 in 15 countries (including 13 EU Member States, Norway and Iceland). It covered the 25 EU countries as well as Norway, Iceland in 2005 (Eurostat, 2008a). In Italy, the fist survey was carried out in 2004 by the National Statistical Institute (ISTAT). This survey was based on a rotational sample panel design, representative at regional level, composed by 61572 individuals belonging to 24270 interviewed households.

In the EU-SILC only marginal attention is devoted to the childcare topic. However, we prefer this database to others providing more details on childcare use, for its rich information on household's socio-economic characteristics. As mentioned in other studies (e.g. Del Boca et al. 2004), the lack of databases providing both detailed information on childcare and household's economic characteristics forces to privilege one of the two aspects or to link together different sources, which anyway requires not negligible efforts.

As the ECHP, the EU-SILC provides cross-sectional and longitudinal information at household and individual level, for all household members aged 16 and over. Broadly, the information belonging to the household, such as expenses and dwelling conditions, is collected at household level. The information belonging to the individual, such as the educational and employment career or the health conditions, is collected at individual level.

On the base of the experience of the ECHP, the EU-SILC has been planned to overcome the drawbacks shown by its predecessor. Particularly relevant was considered the timeliness of the information provided. EUROSTAT releases yearly a cross-sectional User Data Base (called UDB) of the surveys carried out two years before, followed after a few months by a longitudinal UDB. In order to provide timely information, some restrictions have been applied. In principle, longitudinal and cross-sectional information may be collected on different samples, and consequently the longitudinal and cross-sectional datasets cannot be linked. This allows countries to release cross-sectional information sooner and independently from the longitudinal ones. In practice, many countries adopt a rotational panel design, and consequently the cross-sectional and longitudinal samples partly overlap. However, the datasets cannot be linked for these countries either.

Although the cross sectional and longitudinal UDB have most of the variables in common, some belong to one release only. In particular, information about childcare is collected for all the current household members not older than 12 years, and are provided in the cross-sectional UDB only. Consequently, we cannot use a longitudinal approach to analyse the evolving of childcare strategies according to possible changes at household or household members' level. Thus, in this paper we have to apply a cross-sectional approach to investigate the household and parents characteristics associated with the current use of different childcare strategies.

Another drawback of this data source is that the yearly collected variables refer to different time periods that do not overlap completely. Particularly, the income reference period is usually the previous calendar year (i.e. for the survey carried out in 2004, the income variables at household and individual level refer to the 2003). As a consequence, the information about the previous calendar year income does not necessarily reflect the reality at the time of the interview. Other variables instead refer to the last 12 months: this is the case of some information on social exclusion at the household level, or of health variables at individual level. Depending on when the survey is carried out in different countries, the last 12 months might more or less overlap with the income reference period. Eventually, some other variables are collected as they are at the time of the interview, such as the household

composition, the dwelling conditions, the employment condition and the education of the household members.

In the case of the variables under study in this paper, those on childcare refer to a usual week in the current situation. Some of the household and parents characteristics we take into account refer to the same period. The information on household income refers to the previous calendar year, when not necessarily the household was adopting the same childcare strategy.

4.2 The set-up of the multilevel model: individual and contextual variables

Although information is available for different countries, we prefer to focus on Italy, as it offers a particularly interesting framework. Extremely low fertility levels take place in a context characterised by scarce childcare services for very young children and rigidity in the labour market that clearly challenge parent's ability to successfully manage between work and family. In particular, we are interested in childcare strategies for 1-3 years old children at the time of the interview[7], because childcare services for this age are not easily available and in practise used by only the 6 per cent of the children. We also prefer to disregard less than 1 year old children at the time of the interview, because during the first months after the childbirth the mother can rely on parental leave and more flexible labour conditions, and possibly parents have not yet defined an optimal and stable childcare strategy. Eventually, we select children living with both parents because we are interested in studying how the socio-economic profile of parents might be associated with childcare strategies. Under these conditions we select a sub-sample of 1453 children.

The Italian cross sectional UDB provides the following information on childcare which refers to a "usual week" (Eurostat, 2008b):

- Number of hours of education at preschool or compulsory school (there is no distinction between public or private school)
- Number of hours of childcare
  - at centre based services
  - at day-care centre
  - by a professional child-minder at child's home or at child-minder's home
  - by grand-parents, others household members (outside parents), other relatives, friends or neighbours

[7] Preliminary analysis confirmed the gap in childcare use depending on the child's age (below age 3 versus 3-5). The younger the child, the fewer formal childcare is used. A focus on one age specific group has been preferred.

We are interested in two specific childcare strategies: (i) *Formal childcare* is defined as the attendance of pre-school implying an economic contribution; and (ii) *Informal childcare* is defined as that provided for free by grand-parents, others household members (excluding parents), other relatives, friends or neighbours. Accordingly, we define two dependent binary variables: (i) Use of *formal childcare* which assumes value 1 if the child attends the school for at least one hour in a usual week, and 0 otherwise; (ii) Use of *informal childcare* if the child receives care by grand-parents, other household members (excluding parents), other relatives, friends or neighbours for at least one hour in a usual week, and 0 otherwise.

Parents might decide to use any of these two strategies, depending on the opportunity-costs of each choice. These may depend on child's characteristics, such as age (the younger the child the harder is for parents leave him/her to the care of somebody else), but also on parents' characteristics, like employment conditions, education or earnings, which are probably relevant for determining the convenience of relying on childcare provided by relatives and friends rather than exchanging one hour of work with an hour of care personally devoted to the child. Also the household structure may determine childcare choices, for instance, the presence of other young children to care and other adults in the household that may provide parents' with support.

Eventually, opportunity-costs have to be defined also according to some characteristics of the context where the household lives. For instance, where the supply of childcare services is higher and their costs lower, we expect that parents are more likely to rely on formal childcare. Furthermore, the labour market characteristics might as well contribute to shape the opportunity-costs by providing flexible forms of employment. According to this reasoning, considering only household or parents characteristics when investigating childcare preferences would not be enough, because similar households might behave differently, depending on where they live. As we argued, the availability of public or private childcare services, the accessibility to the former and the costs of the latter appreciably differ across regions. Similarly, Italy is characterised by relevant differences in the regional labour markets, in terms of availability of jobs and flexible forms of employment. Therefore, we use also the information on the region of residence of the interviewed household.

In order to take explicitly into account the variability both at individual and regional level, we perform a random intercept multilevel logistic regression (Snijders and Boskers 1999) to model the use of *formal childcare* (Model 1 in Table 3), and the use of *informal childcare* (Model 2 in Table 3). In the multilevel framework we define the child as the

observation of *level 1* and the region as the observation of *level 2*[8]. Italy is divided into 20 regions, but since for one of them, Trentino-Alto Adige, information is available for the "Autonomous Provinces" of Trento and Bolzano, we have 21 *level 2* observations.

We expect to find regional heterogeneity in the use of formal and informal childcare in Italy, as well as a significant association between contextual characteristics and the adopted childcare strategy. Thus, regional heterogeneity in terms of childcare services and labour market may reflect regional heterogeneity in terms of use of formal and informal childcare. According to this hypothesis, households living in the same region behave similarly and are more likely to adopt the same childcare strategy, being its convenience determined by the same labour and childcare "markets" characteristics.

Thus, we include in the model three groups of independent variables regarding: (i) regional characteristics; (ii) household characteristics; (iii) parents' and child's characteristics.

Regional characteristics. As aforementioned we take into account two components at regional level that might be relevant for the analysis of childcare use: the childcare supply and employment characteristics. Regarding childcare supply, we consider two indicators: the private and public childcare availability, measured in terms of the number of the available places divided by the resident population below age 3 (source: Istituto degli Innocenti 2002, reference period 2000) and the family contribution to the coverage of childcare costs, measured in terms of the percentage of service costs covered by the family (source: ISTAT, reference period 2004). We believe, first , that where services are more available, parents are more likely to use formal childcare and have less need of using informal childcare or other strategies. Second, we expect that the higher the costs for using formal childcare, the less the parents are likely to use formal childcare arrangements and look for alternative solutions.

For what concerns the regional labour market characteristics, we consider the male and female employment rates and the availability of part-time, measured as the percentage of part-time employments (source: ISTAT reference period 2006). Possibly high employment rates are associated with a higher use of formal childcare, the latter used as a means for work and family reconciliation. However, we expect that where there is a higher availability of part-time jobs, the use of formal childcare is lower. We believe that more flexibility in working arrangements allows parents to adopt cheaper but more time demanding strategies, as the informal childcare.

[8] The presence of siblings below age 3 in the household would have needed the use of a further hierarchical level: child (level 1), household (level 2), and region (level 3). Preliminary analysis showed that there was not a significant heterogeneity among households, and thus a three level structure is not necessary.

Household characteristics. We consider two dimensions of the household composition that might be associated with the preference for a strategy: the presence in the household of at least another young child (say 0-5 years old) and of al least another adult (say 18 years old and over), apart from the child's parents.

As we aforementioned, in Italy the use of formal childcare for young children might be compromised because the supply of public services is scarce, and the costs of private services are not easily affordable. Thus, we believe that if there are other young children in the household, the convenience of using formal childcare might be reduced because it should be guaranteed to more than one child. The use of alternative strategies might be more economically convenient and preferred: e.g. parents might rely on informal childcare or decide to reduce or quit the labour market activities to take personally care of their children. Similarly, we expect that the presence of other adults than the parents in the household may be associated with a lower propensity to use formal childcare, because parents may count on the support of the other adults in the household. Conversely, following the same reasoning, we think that the presence of young children as well as adults in the household might be associated with a higher probability of using informal childcare. This strategy might represent an economically more convenient solution and a preferred alternative, since the children would be looked after within the family sphere.

In order to investigate the relation between the household economic conditions and the use of childcare strategies, we include in the model the household equivalised disposable income as a measure of the household economic well-being. Considering the deciles of the national household income distribution, we define as "low income households" those who have an income lower than the third decile, as "medium income households" those in between the third and the seventh decile, and as "high income households" those who have an income higher than the seventh decile. Compared with "medium income households", we believe that wealthier households access more hardly to public pre-schools, but more easily to the private ones. We expect the net effect to be in favour of the use of formal childcare, and a lower need to rely on informal care. Conversely, "low income households" are probably not able to afford a private pre-school, but have much higher chances to have access to public ones. As a consequence, we think that these households have a higher probability to use formal childcare and a lower need to rely on informal care.

Eventually, since the household's preference for the use of one type of care might depend on the use of the other one, we control for this effect by introducing in the model for formal childcare as independent variables the number of hours spent by the child in informal

care, and *vice versa* in the model for informal childcare. We should observe that the higher the number of hours spent in formal childcare, the lower the use of informal care, and *vice versa*. This would be in accordance with the most popular strategy that helps parents take care of their children during the whole working day.

Parents' and child's characteristics. We control for the age of the mother's age. Furthermore, we include both parents' educational level, the employment status, working hours and personal earnings. In particular, we define as highly educated those who have completed at least the high school. We assume that more educated parents might prefer using formal childcare because they might appreciate more the opportunity of socialization and the relationship with teachers (Del Boca, Locatelli, and Vuri, 2005; Del Boca and Vuri, 2006). Moreover, more educated parents might face higher opportunity-costs for reducing their participation in the labour market and for taking care of their children. Thus, they are likely to rely on formal or informal childcare. We believe that the effect of education is more evident for women, especially in Italy where a traditional division of gender roles still makes women responsible for reconciling household related activities and employment. As far as the employment is concerned, we consider for each parent separately whether employed full-time, part-time or inactive for any reason (unemployment, education or other reasons). Part-time employed parents might be less likely to rely on formal or informal childcare, as for having more time to spend with the children. The same is expected if the mother is inactive: e.g. women might have decided to quit the labour market, at least for a while, in order to take care of their young children. Furthermore, besides the household equivalised disposable income, we consider the parents earnings (i.e. the year net income, expressed in thousands, as a continuous variable), as for representing how much they would lost economically if they spent time with the children instead of relying on formal or informal childcare. Thus, we expect that the higher are the earnings, the higher the probability of using either formal or informal childcare. Eventually, we also consider the child's age (as a continuous variable, expressed in years), because we expect that the younger is the child, the less parents use formal childcare services, for an aversion to leave the child when extremely young.

5. Results

We wanted to investigate, first, how much of the total variability in childcare use can be explained by regional heterogeneity and, second, we tried to explain this variability by including in the model both regional and household level characteristics. In order to test the assumption about the presence of heterogeneity in childcare use among the households living

in different regions, we estimate the so called *null model*, i.e. a two level model without covariates. The estimates show that both for formal and informal childcare there is significant intra-class correlation. In fact, for the use of formal childcare we have rho=0.0139 (standard error=0.0105 and likelihood-ratio test significant at level $p< 0.05$). Even higher is the intra-class correlation for the use of informal childcare, because the rho=0.0322 (standard error=0. 0157 and likelihood-ratio test significant at level $p< 0.001$). Therefore, the variability at regional level significantly explains a part of the total variability of the phenomenon. In other words, parents living in the same regions behave similarly and are more likely to use the same childcare strategies. The assumption that different regional characteristics shape childcare choices finds empirical support. We suppose that the heterogeneity in the use of formal childcare is mainly due to the regional supply of childcare services. Similarly, we argue that the use of informal childcare might depend on the supply of informal support provided by relatives or friends. The evidence that the use of informal childcare is even more heterogeneous than the formal one, may suggest that regional differences in family ties and networking are even more relevant than those in childcare services.

Focusing on *regional characteristics*, we explain the regional heterogeneity in the use of the two childcare strategies by considering the childcare availability and the percentage of childcare costs covered by parents. According to our assumptions: (i) the larger the supply and (ii) the lower the percentage of the service costs covered by parents, the higher is the probability for parents to use formal childcare services. Regarding formal childcare use, for both regional covariates the association is statistically significant (see Model 1 in Table 3). Thus, the "childcare market" appears to significantly shape parents decisions about the use of formal childcare. This result suggests that social policies aiming at increasing the supply and decreasing the costs of formal childcare would support families in the demanding task of taking care of their children. In contrast, these variables are not significantly associated with the use of informal childcare, and we prefer not to show them in the final model. We argue that the use of informal care is not necessarily considered as the second best choice, after the use of formal care, but rather a good alternative that can be chosen when the offer of support by other relatives and friends is available.

The second set of regional characteristics describes the labour market. In particular, we test the effect of the male and female employment rates and the percentage of female and male part-time jobs. We find out that male indicators are never significantly associated with the use of the childcare strategies under study and the estimates are not included in the models. In contrast, (i) the higher the female employment rates, the higher the use of informal

childcare; and (ii) the higher the percentage of female part-time jobs, the lower the use of informal childcare (see Model 2 in Table 3). Female indicators are not significant in the use of formal childcare, and we prefer not to include them in the final model. The relevance of the female indicators and the irrelevance of the male indicators suggest that early childhood care in Italy is mainly a women's responsibility. Men's devotion to work is not questioned when parents have to decide who should take care of the children. In contrast, a higher participation of women in the labour market implies the need of finding an alterative to the care of children, that according to our findings is represented by the support provided by parents and friends. On the other hand, mostly women profit from the availability of part-time jobs[9] to reconcile work and family related activities. That these labour market characteristics are not associated with the use of formal childcare suggests that this option is preferred not necessarily when needed, because the mother works, but mainly when childcare services are available.

Regarding the *household characteristics*, in contrast with our assumption, we find that neither the presence of other young children nor that of adults is significantly associated with the use of formal or informal childcare. However, the use of an alternative childcare strategy plays a role. As expected, the higher is the number of hours of informal care provided to the child, the lower is the probability of using formal childcare. The vice versa is true as well. The use of a strategy reduces the need for the use of the other one, although they are not exclusive. An interesting finding is that the household economic situation is relevant: wealthier households are more likely to use formal childcare, and poorer households are less likely to use informal childcare. The finding that better-off households are more likely to use formal childcare suggests that the use of public and private services implies an economic effort. We believed worse-off families to have an easier access to public services, and consequently to be more likely to use formal childcare than medium income households, but this seems not to be the case. An interpretation to this result is that those rules thought to help lower income households to use public services may not be adequate, or that public services available might be too few to provide valuable support to this type of families.

When considering the *parents characteristics*, we notice that father's educational level, employment or personal earnings are not significantly associated with any of the childcare strategies of interest. Once again, findings at individual level seem to confirm what we argued when discussing regional indicators: childcare is mainly a mother's problem. Possibly,

[9] The percentage of men who use part-time jobs is 4.7%, much smaller than that of women which is 26.5%.

father's socio-economic characteristics are not relevant because it is not the father who has to decide whether to renounce to one working hour for personally taking care of the children, or to rely on the support of a nursery or a relative because more economically convenient. In fact, employed mothers, either part-time or full-time, are more likely to use both formal and informal childcare, possibly in order to find a balance between family and work duties. The estimates show also that full-time workers have a higher propensity to use formal childcare than part-time workers, while the latter are more likely to use informal childcare than the former. Mothers who have more time may more easily rely on the support provided by relatives and friends, because it is required for a limited amount of time. In contrast, full-time workers slightly prefer formal childcare because they need a stable and full-time solution.

Parents' income is not significantly associated with the use of formal childcare, possibly because once the household economic situation is taken into account, personal earnings do not represent a further constraint. The use of formal childcare, being costly, is decided at family level and depends more on the whole family economic possibilities than on each parent's earnings. For the use of informal childcare, father's earnings do not play a role, but mother's do. The higher the mother's income, the more informal childcare is used. In this case, being informal childcare provided for free, the decision to use this strategy seems to be convenient when a woman's opportunity-costs of reducing work are particularly high. Once again, the fact that this is not true for men suggests that they do not have to balance their time between family and work, as certainly women do.

More educated parents were expected to be more likely to use formal childcare, for valuing children socialisation[10]. This assumption is not confirmed, possibly suggesting that in Italy it is more the limited childcare availability and accessibility that hampers the use of formal childcare rather than different, culturally driven, parents' views on childcare use for very young children. Highly educated women are more likely to rely on informal childcare, possibly because, as discussed for the earnings, these women face higher opportunity-costs if reduce the labour force participation.

Women's age is not relevant in the use of the childcare strategies, showing that these decision are not associated with generational values, or life stage needs.

Eventually, the use of formal childcare increases with child's age, confirming the aversion to formal childcare when the child is young and probably the possibility to take

[10] We also tested whether contrasting parents with at least a university degree against the others we could confirm our assumption, but also in that case education was not significant at all.

parental leave during the first year, while this is not true for the use of informal childcare, possibly indicating that parents feel more comfortable leaving their children to relatives.

6. Concluding remarks

In our paper we find out that, besides household level characteristics, a significant part of the total variability of childcare use can be explained by regional differences related to the childcare system and the labour market. At the regional level childcare supply favours the use of formal childcare, although compromised by increasing childcare costs. The use of informal childcare is less likely in regions with a higher percentage of women working part-time, but more common in regions with higher female labour force participation. It seems, thus, that informal care is not just a choice driven by cultural factors, but also a need. Considering jointly the results of the two models and the positive correlation between childcare supply and female employment rates, we could argue that in regions with higher childcare availability and higher women's participation in the labour market both formal and informal childcare are used to reconcile work and family. In order to support families in their fertility choices, employment-related decisions and in the care of their children, family policies should address explicitly the need of more childcare services and more flexible working arrangements, without penalising the professional career. Furthermore, we notice that women are mainly accounted for early childhood responsibilities in Italy. Therefore, a cultural change towards a more gender-equal division of work between the partners might help families and women more easily fulfil their fertility and professional desires.

Table 3 - Random intercept multilevel model estimates for the Use of Formal Childcare (Model 1) and the Use of Informal Childcare (Model 2)

MODEL 1					MODEL 2				
Use of Formal Childcare					***Use of Informal Childcare***				
	Coef.	Std. Er.	p-val.			Coef.	Std. Er.	p-val.	
Regional characteristics									
CC availability	0,060	0,022	0,007	**	-	-	-	-	
% expenditure for CC	-0,015	0,009	0,082	*	-	-	-	-	
-	-	-	-		*% Part-Time Women*	-0,033	0,019	0,078	*
-	-	-	-		*Female Empl. Rate*	0,014	0,007	0,042	**
Household characteristics									
Other child 0-5 years					*Other child 0-5 years*				
No	Ref.				No	Ref.			
Yes	-0,181	0,148	0,223		Yes	-0,069	0,134	0,604	
Other adults > 18 years					*Other adults > 18 years*				

No	Ref.				No	Ref.			
Yes	-0,233	0,247	0,345		Yes	0,238	0,221	0,282	
HH income					*HH income*				
Medium (4-7 dec.)	Ref.				Medium (4-7 dec.)	Ref.			
High /8-10 dec.)	0,398	0,198	0,044	**	High /8-10 dec.)	0,122	0,168	0,467	
Low(1-3 dec.)	-0,118	0,183	0,519		Low(1-3 dec.)	-0,432	0,173	0,012	**
Hours of informal CC	-0,026	0,006	0,000	***	-	-	-	-	
-	-	-	-		*Hours of formal CC*	-0,009	0,004	0,043	***
					Parents' & child's characteristics				
Child's age	1,801	0,097	0,000	***	*Child's age*	0,126	0,086	0,141	
Mother's age	0,007	0,014	0,642		*Mother's age*	-0,016	0,013	0,234	
Father's education					*Father's education*				
compulsory school	Ref.				compulsory school	Ref.			
secondary/university	0,069	0,153	0,652		secondary/university	0,034	0,135	0,799	
Mother's education					*Mother's education*				
compulsory school	Ref.				compulsory school	Ref.			
secondary/university	0,170	0,158	0,283		secondary/university	0,259	0,144	0,072	**
Father's occupation	Ref.				*Father's occupation*				
Employed					Employed	Ref.			
Inactive	-0,064	0,225	0,776		Inactive	-0,318	0,222	0,153	
Mother's occupation					*Mother's occupation*				
Inactive	Ref.				Inactive	Ref.			
Part-time	0,573	0,208	0,006	***	Part-time	1,170	0,172	0,000	***
Full-time	0,647	0,202	0,001	***	Full-time	0,875	0,169	0,000	***
Father's earnings	-0,007	0,007	0,375		*Father's earnings*	-0,005	0,007	0,419	
Mother's earnings	0,004	0,011	0,718		*Mother's earnings*	0,030	0,010	0,002	***
Constant	-4,384	0,405	0,000	***	Constant	-1,079	0,531	0,042	**
sigma_u	0,2295	0,1060			sigma_u	0,0241	0,0276		
rho	0,0158	0,0143			rho	0,0002	0,0004		

(***) p<0.01; (**) p<0.05; (*) p<0.1

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