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Childcare, mothers' work and children's schooling outcomes. An analysis of Italian data

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Daniela Del Boca[1], Silvia Pasqua[2], and Simona Suardi[3]

Abstract:
In this paper we explore the relationship between parents' inputs, childcare inputs and child cognitive outcomes using one of the few data sources available for Italy, the ISFOL-PLUS dataset. Our empirical results indicate that mothers' work, in reducing the time devoted to children, has negative effects on children's academic results. This impact, however, is offset by the use of childcare. The positive effects of childcare are stronger for children from lower income and education households.

Keywords: mothers' employment, childcare, child cognitive outcomes

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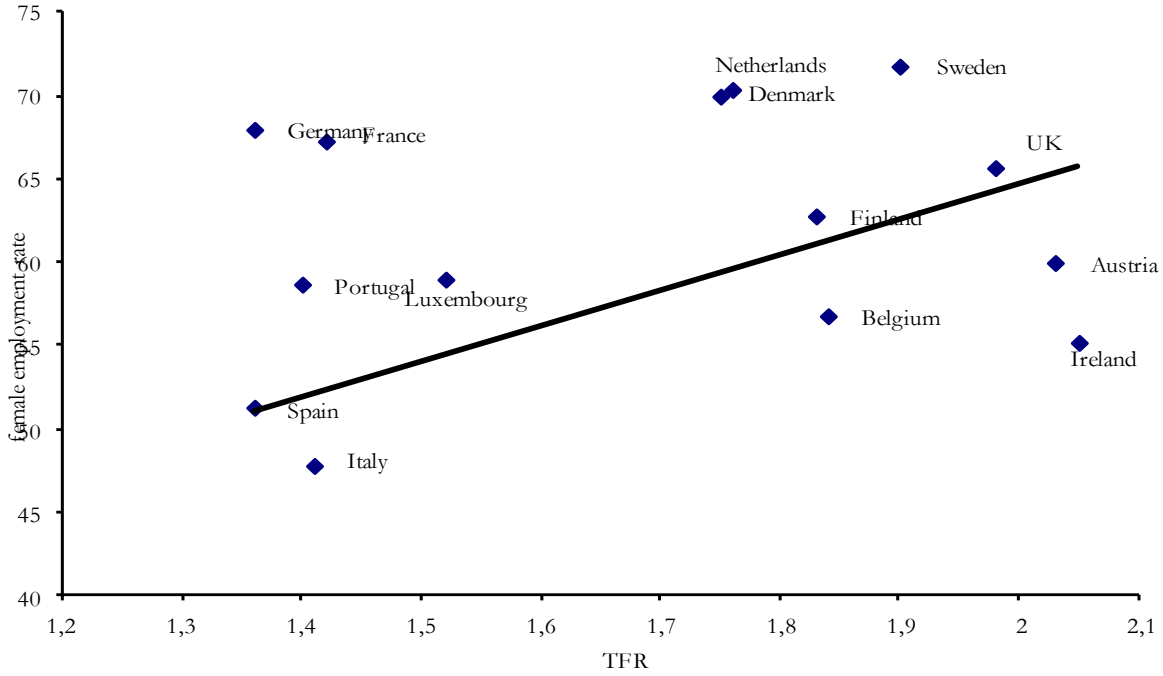
Contents

1. Introduction

While for Northern Europe and the US a large literature has analyzed the impact of childcare and mothers' work on child cognitive and non cognitive outcomes, in Italy this issue has been neglected. On the one hand in Italy the concern for the decline of mothers' time with their children is likely to be less than in the other European countries since the participation of women to the labour market is much lower. On the other hand, fertility rates of Italian women have continued to decline and have reached one of the lowest levels in Europe (Del Boca and Wetzels, 2008). While in Northern European countries and France female employment and fertility rates are now both high, also as a results of more generous childcare policies, in Italy (as in Spain and Greece) are both quite low (Figure 1).

Figure 1 - Female employment rate and fertility across European countries (2011)

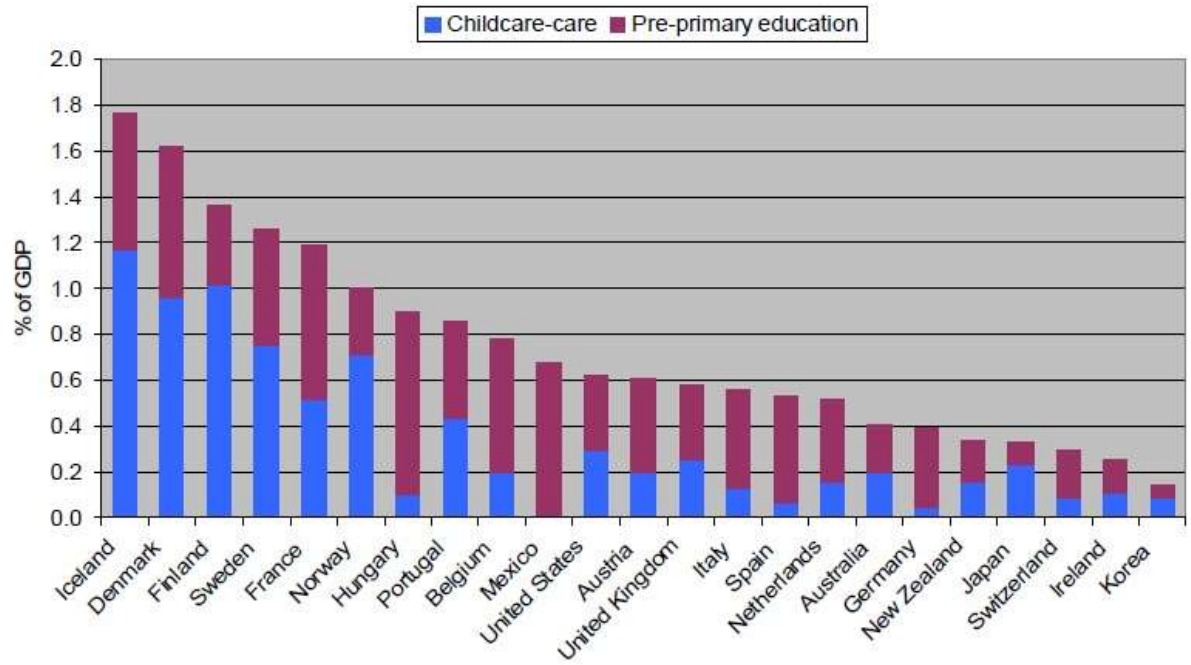


Sources: OECD and Eurostat websites

Given the low labour market participation and fertility rates, one could expect that more time is dedicated by parents to Italian children with positive impacts on child cognitive outcomes relatively to other countries where women are more involved in the labour market and have more children.

Instead, comparative data indicate that Italian children have not obtained better results than their peers in other countries (PIRLS and PISA-OECD, 2007), quite the opposite is true. Among the reasons for the low ranking of the schooling performance of Italian children is the lower early public school investments. Italy in fact spends much less than other countries on children of preschool age.

Figure 2 - Spending for child care and pre-primary education as a percentage of GDP



Source: OECD Family Database 2010.

As a consequence childcare availability is one of the lowest in Europe and much lower than what the EU directives recommend (at least 33% of children under three years old should be enrolled).

In spite of the potentially interesting implications of the unique combination of low fertility and low participation and limited childcare availability in Italy, little or no attention has been devoted to the impact on child outcomes, also for the lack of data. Only very recently, thanks to a collaboration with ISFOL[2], whose datasets include information on children schooling grades, several retrospective questions about mothers' work and the use of formal childcare during early childhood were added to the 2007 wave.

The aim of our research is to analyze the impact of formal childcare attendance and mother's work on school grades later in life, controlling for socio-demographic factors. Our empirical results show that while having a working mother when very young does not impact children high school grades significantly, the impact of attending childcare is positive and significant and particularly relevant for children who come from families with lower levels of education.

The paper is organized as follows: in Section 2 we summarise the contributions relevant for this topic. In Section 3 we discuss the characteristics of childcare in Italy. In Section 4 we describe the dataset and the methodology we use to estimate the impact of mothers' work and formal childcare use on child's schooling outcomes, conditionally on other socio-demographic factors. Results are presented and discussed in Section 5. Conclusions follow.

[2] ISFOL – Istituto per lo Sviluppo della Formazione Professionale dei Lavoratori.

2. Literature review

Because of parents' growing reliance on formal childcare to help with child-rearing the increasing number of mothers working, researchers and policy-makers have focused new attention on the importance of child-care arrangements, mothers' labour market participation and child outcomes. While a large literature has analysed the impact of mothers' work for more than two decades, the literature on childcare's impact on child outcomes is more recent and more limited.

The empirical results of the studies on the impact of mothers' work on child cognitive outcomes are quite mixed (Ermisch and Francesconi, 2005). Some studies find that mothers' work impacts in a negative way child development (Baydar and Brooks-Gunn, 1991; Desai *et al.*, 1989; Bernal 2008). On the opposite, other studies find a positive and significant impact (Vandell and Ramanan, 1992), while others do not find any significant effect (Blau and Grossberg 1992). In part, this reflects two potential effects: on the one hand, working mothers spend less time with their children, which has a potentially negative effect on the children's well-being (both in socio-emotional and in cognitive terms); on the other hand, the income earned through their work can bring greater opportunities for spending on goods and services for the child (Bernal, 2008).

The different results may also depend on the different variables considered. Some studies consider only mothers' employment, while others consider mothers' actual time with the children. Mancini and Pasqua (2012) have shown that working mothers are likely to reduce the time they spend on domestic activities and their own leisure before reducing the time they spend with their children. Other differences may depend on the inclusion of different mothers' characteristics. Hsin (2009) considers also mothers' education and finds a positive and persistent effect of the time mothers spend with children on children's language development, but only among children with verbally skilled mothers. Her findings suggest that maternal time may differentially affect children outcomes since women differ in their ability to influence their children's cognitive development.

More recently other researchers have focused also on the role of formal childcare as a substitute for the working mothers' time. Only in the last few years there is a growing number of research examining the impact of the use of formal childcare during the first years of life on later schooling outcomes. Most of these recent studies come from the US and Northern European countries. Among others, in the US, Currie *et al.* (2002) find that attendance of Head Start Program increases the chances that a child will attend high school and college and

increases also later adult earnings. Fitzpatrick (2008), evaluating the Universal Pre-K program, show a positive impact on both reading and mathematics test scores at fourth grade as well as the probability of students being on-grade for their age. Brilli (2012) analyses both the impact of mothers' time and childcare use and show that while a reduction in maternal time with the child induces a negative effect on reading test scores, this is compensated for by the use of an equal amount of external childcare. Similarly Brooks-Gunn *et al*. (2002) find that children whose mothers are working by the child's ninth month have lower cognitive development scores than children of non-working mothers, but that high quality childcare can help counterbalance these effects.

Havnes and Mogstad (2011) find that a substantial change in childcare supply in Norway in the 1970s had strong positive impacts on children's cognitive outcomes, although the impact is much stronger for children of low educated parents. Their results suggest a positive and significant impact of childcare coverage on educational outcomes, such as years of education and college attendance. This is because individual abilities are more malleable in the early years of life and because early investment can have a cumulative effect over time (Cunha and Heckman, 2008, Carneiro and Heckman, 2003). Datta Gupta and Simonsen (2010) evaluate the impact of childcare exposure at age 3 on children's cognitive outcomes at age 11, in Denmark. They find that having attended high-quality pre-school has a positive impact on language and problem solving tests scores, and it also decreases the probability of grade retention. Felfe *et al.* (2012) evaluate the effects of a policy, implemented in Spain during late 90s, introducing universal childcare for 3-years old children, on their cognitive outcomes at age 15, using PISA data. They estimate a sizable increase in reading and math test scores following the reform. Similar results have been report by Dumas and Lefranc (2010) analyzing the case of France. Most of the studies also show that children from disadvantaged families and with less educated parents benefit more, in terms of cognitive outcomes, from attending early childcare (Currie and Thomas, 1995; Fitzpatrick, 2008; Havnes and Mogstad, 2011; Felfe *et al.*, 2012).

Our study contributes to the literature providing an empirical analysis of the impact of both mothers' work and early childcare attendance on children's schooling outcomes in high school in Italy. As discussed above, studying this issue in Italy has important policy implications. Since maternal employment rate and fertility rate are both low, the expansion of childcare policies may create an incentive to women to participate more to the labour market and having more children (Del Boca, 2002; Del Boca and Pasqua, 2005) and it may also impact in a positive way on children cognitive outcomes.

3. Childcare availability: International and regional comparisons

Compared with Northern European countries and France, the options available to parents in Italy for caring for their children are more limited. Parental leave is shorter and not as well-paid, paternal leave is discouraged, opportunities for part-time work are harder to find and childcare services for children under the age of three are less available.

Table 1 compares the proportion of families using 'formal' (public and private) childcare in Italy with that in other European countries. We can see a considerable difference between the age ranges 0-2 and 3-5. About 90% of Italian children aged 3-5 attend formal childcare, which is a proportion higher than in some other European countries. Yet only 24% of children aged 0-2 are enrolled in formal childcare - much less than in other countries - whereas reliance on informal childcare among this age group is greater than in the 3-5 range.

Table 1 - Percentage of use of formal and informal3 childcare (2007)

	Children aged 0-2 years		Children aged 3-5 years	
	formal	informal	formal	informal
Italy	24	20	90	3
Spain	39	16	91	2
France	42	8	95	2
Greece	13	38	63	13
Belgium	45	13	99	0
Sweden	48	0.5	92	0.2
Denmark	72	1.2	85	0

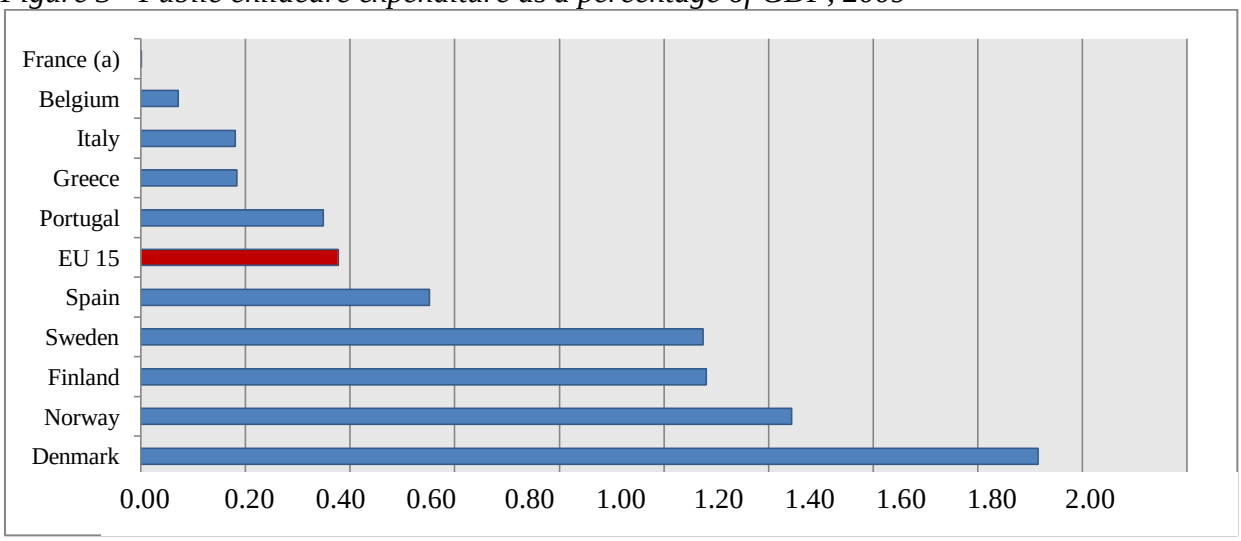
Source: EU-SILC (European Survey of Income and Living Conditions) 2007

The supply of childcare varies across Europe. In Denmark and Sweden supply is almost equal to demand. In Belgium and France, the level of supply is high and the aim is to reach nearly total coverage, while in countries like Spain and Italy, availability is only slowly increasing and demand is much higher than supply (De Haneau *et al.*, 2008).

Italy has traditionally invested less money on family policies than other European countries. In 2009, Italy devolved less than 0.2% of the GDP to this specific sector, ranking much lower than the EU 15 average. The corresponding figure was less than 0.1% in 1990, indicating little investment has been made in early intervention and in reconciliation policies in the last decades.

[3] Informal care is generally defined as care arranged by the child's parent either in the child's home or elsewhere and provided by relatives, friends, neighbours, babysitters or nanny; it is generally unregulated. Children with any formal or informal childcare stay with their mothers.

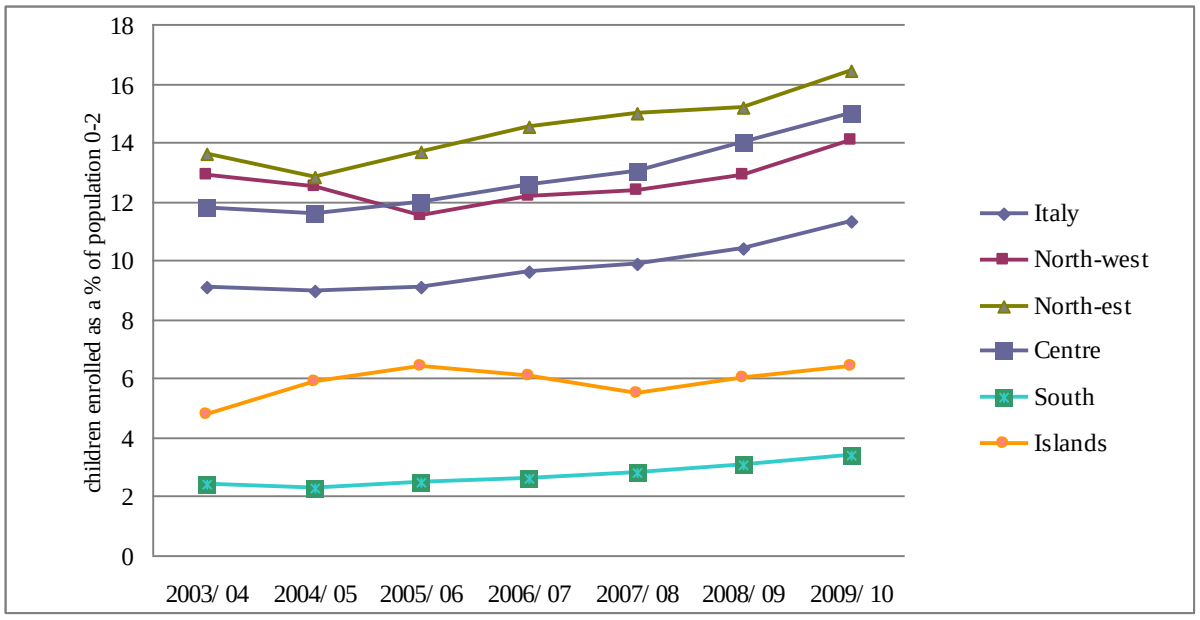
Figure 3 - Public childcare expenditure as a percentage of GDP, 2009



(a) France and Belgium are ranked among the countries with the lowest expenditure, even if their total expenditure of family policies is higher than the EU-15 average. These countries have a particular expenditure composition that privileges child allowances and other benefits to encourage a mainly home based care system. These expenditures are not considered in the table.
Authors' re-elaboration of Eurostat data source.

The supply of childcare in Italy is determined and financed at the local level. As a consequence, strong cross-regional differences emerged during the early development of care services, and have never been properly overcame. The most recent data show that the enrolment rate is at its highest in the Northern and Central regions, while it is persistently at its lowest in the Southern regions and in the Islands (Figure 4).

Figure 4 - Enrolment rate in childcare by area



Authors' re-elaboration from ISTAT

Several Italian studies have shown the potential importance of childcare policies for supporting the combination of work and child rearing. Del Boca and Vuri (2007) show that if childcare supply were to increase to the level of Denmark, the use of the public service in Italy would increase considerably, and the use of private and informal services (grandparents and babysitters) would decline. The effects of childcare on labour market participation varies according to the level of education of the mother (Del Boca *et al*., 2009): a 10% increase in the number of childcare slots would increase the probability of employment by 7% for women with a higher education and by 14% for women with lower levels of education. Del Boca (2002) and Del Boca and Pasqua (2005) has also shown a positive impact of childcare availability on fertility decisions. In the next sections, we will explore the relationship between mothers' work, childcare attendance and child schooling outcomes.

4. The empirical analysis: data and methodology

For our empirical analysis we use data from ISFOL-PLUS, which is the first Italian database that includes individual information on educational achievements together with information on early care. More precisely, the survey entails 40,000 observations obtained from individuals of working age and includes five waves, between 2005 and 2010. For our empirical analysis we selected Italian natives aged between 19 and 30[4]. While the dataset provides information on junior high school, high school and university grades we choose to focus only on high school grades. In 2007, the survey also includes retrospective information on whether the individual was enrolled in childcare when 0-2 years old and whether his/her mother was working at that time[5]. We analyse the impact of formal childcare attendance and mother's work on the probability of obtaining high grades in high school, controlling for socio-demographic factors.

Since childcare use is likely to be endogenous variable, most studies use a Difference-in-Difference approach to identify the effect of childcare on children outcomes by comparing the results of children before and after reforms that significantly increased the availability of slots in childcare centres (Fitzpatrick, 2008; Havnes and Mogstad, 2011; Felfe *et al.*, 2012). Other analyses rely on sibling variation (Currie and Thomas, 1995). We are unable to employ these strategies to solve the endogeneity problem of childcare participation as no major

[4] This avoided the problem of memory bias and allowed us to analyze a sample of individuals who were children when Italian childcare had already developed into the institutional structure we know today.
[5] The questions included in the survey were: "When you were younger than 3, did you regularly attend childcare centres (public or private)?", "Did your mother work when you were younger than 3?" and "Was she working part-time or full-time?"

reform occurred in Italy and no information on individuals' siblings is available in our dataset. Therefore, in order to address the endogeneity problem, we use the IV method within a linear regression model. Moreover, the IV method allows us to take into account also for potential endogeneity in mother's working status when the child was younger than 3.

Our estimation is performed with a linear probability model, which is specified as follows

$$High\ Grade\ in\ High\ School_i = ß_0 + ß_1\ Childcare + ß_2\ Mother\_worked + ß_3\ Z_i + \varepsilon_i$$

where *High Grade in High School* of individual *i* is defined, in our preferred definition, as a dummy variable that equals 1 when the individual has achieved a grade equal to or higher than 55/60 (for individuals who graduated before 1999) or 90/100 (for individuals who graduated after 1999[6]); otherwise it is 0. Is worth to notice that, in the dataset, grades are reported in ranges and therefore it was not possible to construct a continuous variable for school outcomes. The choice of the threshold value to define the "high" outcome was based on the distribution of grades (Table 2): we consider individuals in the highest 30% of the distribution as having a high outcome. We also estimate the model for different thresholds (with "medium-high" grades, in the top 52% of the distribution, and with "very high" grades in the top 13%) to see if the results depend on the definition of our dependent variable.

Table 2 - Distribution of grades in high school

	N.	%
High school		
60/60 or 100/100	1,287	12.6
55-59\60 or 90-99\100	1,666	16.3
48-54\60 or 80-89\100	2,373	23.3
40-47\60 or 70-79\100	2,868	28.1
36-39\60 or 60-69\100	2,009	19.7
Total	*10,203*	*100*

We estimate the probability of obtaining high grades as depending on having attended childcare in the first three years of life (*Childcare*), on the maternal working status when the individual was 0-3 years old (*Mother_worked*, either full-time or part-time) and on family and individual's socio-demographic characteristics Z_i (*i.e.* parents' level of education, age and gender[7]).

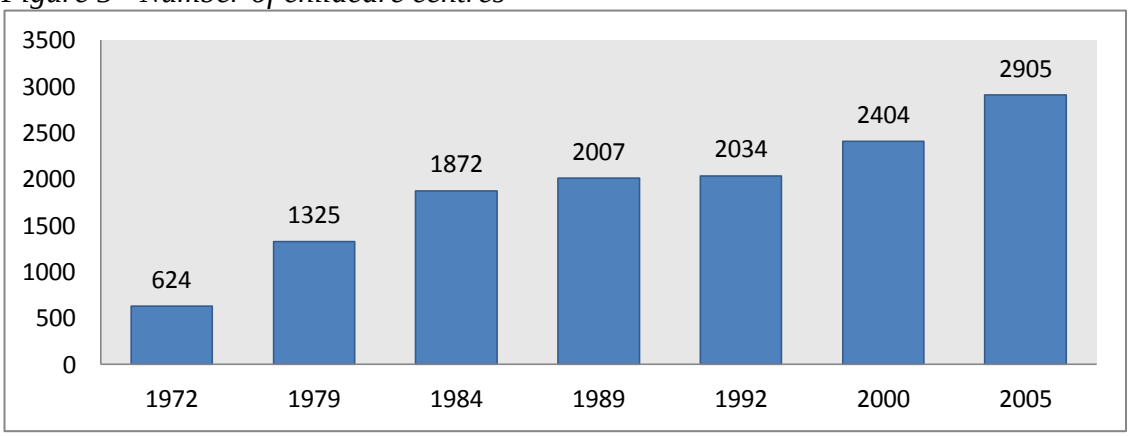
[6] Law n. 425, of the 10th of December 1997, changed the scale of high school grading. As of September 1998 (students graduated from summer 1999), the final grade is calculated out of a maximum of 100 points, substituting the previous scale calculated out of 60 points.

[7] Unfortunately, the dataset reports no retrospective data on parents' income and wealth.

To instrument childcare attendance and mother's work we use the regional supply of childcare, a dummy indicating the high level of paternal education and dummies for the area of residence. We use a measure of regional childcare supply, since families living in regions with greater childcare availability are more likely to enrol their children in childcare. Moreover, childcare availability may positively affect women's labour force participation (De Henau *et al.*, 2008; Del Boca *et al.* 2009).

To construct this instrument, we rely on the *Istituto degli Innocenti*'s regional data on the number of childcare centres, slots available and number of children accepted (Istituto degli Innocenti, 1998). Data on public structures are available from 1972, but privately owned structures only started being surveyed in 1992. For this reasons, we decided to use the 1992 data on regional available slots over 100 children as a measure of both private and public childcare[8] supply. However, this measure is potentially different from the "true" childcare supply when children were between 0 and 2 years old (namely between 1978, when the oldest group of sampled individuals were a few months old, and 1992, when the youngest group of individuals were around 3 years old[9]). As in Figure 5, childcare supply was quite stable during these years, experiencing a noticeable growth only after 2000; therefore it appears reasonable to utilize 1992 data in our model.

Figure 5 - Number of childcare centres



Authors' re-elaboration from *Istituto degli Innocenti*

As shown in Table 3, the regional childcare supply was very heterogeneous throughout the territory (19% of available slots in Emilia Romagna and 0.6% in Campania). On average, in the Northern and Central regions there was a larger proportion of childcare services than in

[8] We consider both private and public supply, because the variable childcare attendance in our dataset refers both to private and public enrolment.
[9] Only children of at least 3 months of age and who are not already 3 years old can be accepted in childcare.

the South. The national average was 5.8 for every 100 children, where the public childcare represents the majority of total slots.

Table 3 - Enrolment rate in childcare (0-2 years) by region (1992)

Italian Region	Slots available for 100 children	Difference from the national mean
Piemonte	10.8	4.9
Valle D'Aosta	7.7	1.8
Lombardia	9.1	3.2
Trentino Alto Adige	5.1	-0.8
Veneto	5.5	-0.4
Friuli Venezia Giulia	5.4	-0.5
Liguria	8.0	2.1
Emilia Romagna	18.8	12.0
Toscana	7.9	2.0
Umbria	8.7	2.8
Marche	8.5	2.6
Lazio	6.6	0.7
Abruzzo	4.7	-1.2
Molise	2.1	-3.8
Campania	0.6	-5.3
Puglia	4.0	-1.9
Basilicata	3.4	-2.5
Calabria	0.9	-5.0
Sicilia	2.4	-3.5
Sardegna	3.3	-2.6
Italy	5.9	-

Authors' re-elaboration.
Data source: *Istituto degli Innocenti* (1998)

To better represent the level of supply compared with the national average, we calculated the difference from the national mean for each region (Table 3, column 2) to use in the construction of our instrument.

However, this measure of childcare supply alone is not enough to instrument childcare attendance. Additional factors, such as parents' preferences and their needs for basic care, affect their decision to enrol their children in childcare. These factors can be proxied with the level of paternal education which we employ as an additional instrument. In fact, we expect that better educated parents are more likely to enrol their children in childcare both because they are more likely to recognize the value of early socialization and because they are more likely to have a well-paying job and to be able to afford high quality childcare costs. Moreover, father's level of education can be considered as a proxy for household's income which may also affect the labour force participation of the mother. The effect of husband's labour income on his wife's labour force participation is negative due to the income effect. However, better educated men tend to marry better educated women (assortative mating) with a higher labour force participation. Often this second (positive) effect prevails over the negative income effect (Del Boca *et al*., 2000).

Two dummies variables indicating whether the individual is living in a Northern region or in a Central region (South being the excluded dummy) are also employed as additional instruments for female working status. In fact, employment rates were (and still are) much lower in Southern regions where the traditional male breadwinner family is still predominant, while higher in the Northern and Central regions.

As already mentioned, for our empirical analysis of the 2007 wave of the ISFOL-PLUS dataset we restricted the age range between 19 and 30 which leaves us with a sample of 12,786 individuals with an average age of 24 years (standard deviation being 3.3), 57% of whom were women. In the sample selected, 14% had a junior high school diploma, 63% a high school diploma and only 23% tertiary education. 44% of the sample lived in Southern regions and on the Islands, 37% in the North and the remaining 18% in the Centre. The variables used in the estimation are defined as follows:

Table 4 - Variables definitions

Outcomes Variables	
High grade in high school	Dummy equal to 1 if grade ≥ 55/60 or 90/100
Medium - high grade in high school	Dummy equal to 1 if grade ≥ 58/60 or 80/100
Very high grade in high school	Dummy equal to 1 if grade ≥ 60/60 or 100/100
Endogenous Variable	
Childcare attendance	Dummy equal to 1 if attended private or public childcare, when < 3 years old; 0 otherwise
Mother worked	Dummy equal to 1 if the mother worked either full-time or part-time, when child was < 3 years old
Low level of maternal education	Dummy equal to 1 if the mother has < tertiary education
Age	Age of the individual
Female	Dummy equal to 1 if female
Missing	Dummy equal to 1 if the observation has a missing value in the variable childcare; 0 otherwise
Instrumental Variables	
Relative childcare supply	Available childcare slots per 100 children by region as difference from the national mean in 1992
High level of paternal education	Dummy equal to 1 if the father has ≥ tertiary education
North	Dummy equal to 1 if the individual lives in the North
Centre	Dummy equal to 1 if individual lives in the Centre
South	Dummy equal to 1 if the individual lives in the South or on the Islands (excluded dummy).

Table 5 reports the descriptive statistics of the variables used for our sample.

Table 5 - Descriptive statistics of the variables included in the estimation

	Mean	Std. Dev.	% missing
Outcomes Variables			
High grade in high school (dummy)	0.289 (†)	-	6.2
Medium or high grade in high school (dummy)	0.520 (†)	-	6.2
Very high grade in high school (dummy)	0.125 (†)	-	6.2
Endogenous Variables			
Childcare use (dummy)	0.324 (†)	-	32.2
Mother worked (dummy)	0.362 (†)	-	36.2
Exogenous Variables			
Low level of maternal education (dummy)	0.507 (†)	-	6.1(§)
Age	24.26	3.269	-
Female (dummy)	0.571 (†)	-	-
Instrumental Variables			
Relative childcare availability	-1.25e-07	4.295	-
High level of paternal education (dummy)	0.135 (†)	-	8.2(§§)
North (dummy)	0.370 (†)	-	-
Centre (dummy)	0.184 (†)	-	-
South (excluded dummy)	0.444 (†)	-	-

(†) = *portion of individuals for which the dummy takes value 1*
(§) = *% of missing values in the variable defining the maternal level of education*
(§§) = *% of missing values in the variable defining the paternal level of education*

Table 6 reports the percentage of individuals obtaining high grades by level of parental education: 36.4% of children of highly educated mothers obtained a high grade in high school, 32.7% of the ones having mothers with medium education degree achieved high grades, while only 24.6% of those having poorly educated mother did. The variability by level of paternal education is less strong: 60% of individuals with a highly educated father obtained high grades in high school, 55.5% of the ones with medium educated fathers and 54.8% with poorly educated fathers achieved high results in high school.

Table 6 - Percentage of individuals with high grades by level of parental education

	High grade in high school
Mother's education	
Low	24.6
Medium	32.7
High	36.4
Father's education	
Low	54.8
Medium	55.5
High	60.1

If we look at the other relevant variables, we observe that 32% of the individuals attended a childcare centre. This percentage is much higher than those reported by statistical sources (see previous section and Table 3). The problem with this variable, and also with that referring to the mother's employment status when the individual was 0-2 years old, is the high

incidence of missing values (32% and 36% respectively). Individuals may find it difficult to answer these retrospective questions precisely. Table 7 shows the characteristics of individuals who answered or did not answer the questions on childcare attendance and mother's work during early years[10]. Individuals who did not answer to retrospective questions are, on average, less educated, with less educated parents and lower cognitive outcomes.

Table 7 - Descriptive statistics of the subsamples with/without missing values

	Observations without missing values	Observations with missing values
High grade in high school	32.6%	21.9%
Medium or high grade in high school	56.8%	43.0%
Very high grade in high school	14.5%	8.8%
Age	24.6	23.6
Female	59.5%	53.0%
Less than secondary school	13.6%	14.7%
Secondary school	51.9%	82.0%
Tertiary education	34.5%	3.3%
High maternal education	12.5%	9.5%
Low maternal education	48.7%	54.6%
High paternal education	14.9%	11.2%
North	41.1%	29.9%
Centre	18.9%	17.8%
South	40.0%	52.3%

In order to correct our estimates for the potential bias associated with the high incidence of missing values, we imputed to the dummy variables *Childcare* and *Mother_worked* value 0 when the value was missing. Furthermore, we introduced in our specification a dummy variable called *Missing* that takes a value of 1 when the observation had a missing variable in one of the relevant valuables listed above. This produces a case similar to that of a variable with three possible values: "yes", "no" and "do not remember". Taking the example for childcare attendance, we have a situation of three dummy variables: *Childcare*, taking value 1 when the individual attended childcare, 0 otherwise; *Missing*, taking value 1 when the individual did not remember, 0 otherwise; *NoChildcare*, taking value 1 when the individual did not attend childcare, 0 otherwise (this is the excluded variable)[11].

This technique has been widely used in the literature. As we will show in the next section, the introduction of the dummy *Missing* does not modify the results much with respect to the estimates regarding the subsample of individuals without missing values. Nevertheless, it allows to increase the sample size and, consequently, to have more precise estimates.

[10] Note that *all* individuals with a missing value in the variable childcare attendance also have a missing value in the variable on mother's work when they were very young.
[11] The same reasoning holds true for the variables *Mother_worked*.

5. Empirical Results

Table 8 reports the estimates on the full sample. The first two columns show the results of the first stage estimates which are consistent with our expectations (see previous Section) and coherent with results previously obtained in the literature. The first stage F-statistics reported in the bottom part of the table show that the instruments used are not weakly defined, meaning that they are able to predict a relevant variation of the endogenous variables, childcare attendance and mother's work.

Table 8 Results from the full sample

1st stage and IV regression assuming linear probability					
VARIABLES	1st stage Childcare Attendance	1st stage Mother Work	IV High grade in high school	IV Medium or high grade in high school	IV Very high grade in high school
	(1)	(2)	(3)	(4)	(5)
Childcare attendance	-	-	0.638***	0.611***	0.349***
			(0.156)	(0.165)	(0.109)
Mother worked	-	-	- 0.042	- 0.097	- 0.075
			(0.085)	(0.090)	(0.060)
Constant	0.587***	0.640***	0.340***	0.408***	0.182**
	(0.035)	(0.035)	(0.122)	(0.130)	(0.086)
Low level of maternal education	- 0.034***	- 0.166***	- 0.061***	- 0.090***	- 0.040***
	(0.009)	(0.009)	(0.022)	(0.023)	(0.015)
Age	0.007***	-0.002	- 0.010***	- 0.002	- 0.005***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Female	- 0.082***	0.008	0.154***	0.188***	0.074***
	(0.008)	(0.008)	(0.017)	(0.018)	(0.012)
Missing	- 0.292***	- 0.548***	0.042	- 0.017	- 0.007
	(0.009)	(0.009)	(0.073)	(0.078)	(0.052)
High level of paternal education	0.038***	0.063***	-	-	-
	(0.012)	(0.012)			
Childcare availability	0.008***	0.006***	-	-	-
	(0.001)	(0.001)			
North	- 0.104***	0.083***	-	-	-
	(0.013)	(0.013)			
Centre	- 0.074***	0.058***	-	-	-
	(0.013)	(0.013)			
Observations	9,447	9,447	9,447	9,448	9,448
First Stage F- stat	19.4***	64.1***			
Underidentification test			67.1	67.2	67.2
Weak identification test			16.9	16.9	16.9
Sargan test (overidentification test of all intruments)			0.47	3.33	6.39
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Columns 3-5 report the results of the second stage IV estimates. In particular, in column 3 we report the estimate for the probability of obtaining a high grade in high school (greater than 55/60 or 90/100, our preferred definition), in column 4 the probability of obtaining a medium-high grade (greater than 48/60 or 80/100) in high school and in column 5 the probability of obtaining a very high grade (60/60 or 100/100). We found that for whichever specification of the dependent variables we employ, childcare attendance affects positively and significantly (at a 1% level) school achievements in high school, and only the magnitude of the effect varies, being the smallest on the probability of achieving a very high final grade. Early childcare increases the likelihood of obtaining high grades in secondary school, confirming earlier evidence on medium- and long-term results for other countries discussed in the literature review.

The results show that having a mother working during their early years of life did not impact negatively children's school performance in secondary school. This finding is quite coherent with previous results. In fact, as shown by Mancini and Pasqua (2012), Italian working mothers, with respect to non-working ones, tend to reduce the "basic care" time, but not "quality care" time devoted to their children (reading stories or helping them with homework, taking their children to a museum or to theatre). Therefore, even if working, they may be able not to reduce the time devoted to activities which are more likely to positively influence the school results of their children.

The coefficient associated to the low level of maternal education is negative as expected: children of mothers with only primary education have, *ceteris paribus*, a 6% lower probability of achieving good grades. Mothers with low level of education, in fact, are more likely to have low-paid jobs (or no job at all), with a negative impact on household income and consumption and relatively to higher educated mothers are likely to provide less quality inputs potentially relevant for children's cognitive outcomes. This finding confirms results from previous studies (Hsin, 2009).

This suggests that children living with low educated parents are likely to benefit relatively more from childcare opportunities, since childcare may compensate for lower or insufficient inputs potentially received in their families confirming previous literature (Currie and Thomas, 1995; Fitzpatrick, 2008; Havnes and Mogstad, 2011; Felfe *et al.*, 2012).

Other dimensions related to behavioural outcomes could also be important and potentially affecting the cognitive outcomes themselves (Heckman and Kautz, 2012). The role of mothers' education in contributing to the development of these abilities may be less important. Unfortunately no data on non cognitive outcomes are available in our dataset.

Finally, our results show significant gender differences: girls achieve on average better results than boys.

The variable *Missing* is not significant. Despite this, as a robustness check, we also run the estimates on the (reduced) sample of individuals for which we have no missing values. Results are reported in Appendix I and are similar in sign to those of Table 8, but the magnitude of the coefficient of childcare attendance variable is reduced. The tests reported in the bottom part of Table 8 (and in the Table in Appendix 1) confirm that the model is correctly specified.

6. Conclusions

In this paper, we use the ISFOL-PLUS dataset on a sample of Italian individuals to estimate the effect of early childcare attendance and mother's work on children's school outcomes. Despite its several limitations, ISFOL-PLUS is a unique Italian dataset providing information on early childcare experiences, family socio-demographic background and educational outcomes in high school.

Our empirical results indicate that childcare attendance when young has a positive effect on children grades in high school, while mother's working status seems to have not a significant effect. The probability of getting good results in high school is also linked to the socio-economic status of the families. Mother's schooling seems to significantly affect the child's probability of achieving high grades. Our interpretation is that when mothers are highly educated, they are likely to contribute to their children's cognitive development with higher quality time inputs. In families characterized by low education, a "compensating" effect of childcare use seems to play an important role for later achievements in school. Therefore, childcare is important for the cognitive development of children, particularly in disadvantaged contexts.

This finding has potentially important policy implications indicating that the provision of childcare facilities should be expanded in Italy, in order to provide more adequate and homogeneous coverage throughout the country and to allow all families, irrespectively of their socio-economic background, to access the service. A further extension of childcare would be also important in supporting mothers' labour market participation as well as fertility rates which may be of crucial importance in Italy, as shown in our previous studies.

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Appendix

Results from the sub-sample of individuals with no missing values

1st stage and IV regression assuming linear probability					
VARIABLES	1st stage Childcare Attendance	1st stage Mother Work	IV High grade in high school	IV Medium or high grade in high school	IV Very high grade in high school
	(1)	(2)	(3)	(4)	(5)
Childcare attendance	-	-	0.440***	0.503***	0.258**
			(0.139)	(0.149)	(0.102)
Mother worked	-	-	- 0.018	- 0.067	- 0.050
			(0.071)	(0.076)	(0.052)
Constant	0.757***	0.715***	0.432***	0.365**	0.259**
	(0.050)	(0.051)	(0.140)	(0.150)	(0.103)
Low level of maternal education	- 0.054***	- 0.250***	- 0.060**	- 0.089***	- 0.043**
	(0.012)	(0.013)	(0.028)	(0.030)	(0.021)
Age	- 0.011***	- 0.004**	- 0.011***	0.001	- 0.007***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
Female	- 0.114***	- 0.012	0.145***	0.179***	0.064***
	(0.011)	(0.012)	(0.021)	(0.022)	(0.015)
High level of paternal education	0.045***	0.085***	-	-	-
	(0.017)	(0.017)			
Childcare availability	0.011***	0.009***	-	-	-
	(0.002)	(0.002)			
North	- 0.148***	0.131***	-	-	-
	(0.018)	(0.019)			
Centre	- 0.111***	0.88	-	-	-
	(0.019)	(0.019)			
Observations	6,323	6,323	6,323	6,323	6,323
First Stage F- stat	18.9	68.5			
Underidentification test			57.5	57.5	57.5
Weak identification test			14.5	14.5	14.5
Sargan test (overidentification test of all intruments)			0.30	2.77	3.46
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					