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ABSTRACT

Child Care Choices by Italian Households*

In spite of relatively generous public subsidies and a reputation for high quality, only a very limited proportion of Italian families use public child care. In this paper we explore the significance of various factors on the choices made between different types of child care. In part one, we use a simulation exercise to show the impact of cost and availability on child care choices. In part two, we present the results of an explorative econometric analysis using a matched data set for 1998 from the Bank of Italy (SHIW) and ISTAT Multiscopo. We find evidence that factors related to family composition and support as well as to the characteristics of child care are important in explaining the choices made by Italian families. Assistance provided by grandmothers and husbands appears to be of crucial significance to Italian mothers who are seeking to reconcile the difficulties stemming from the rigidity of the labor market and the limitations of child care. Rationing, both of public and private child care, also proves to be an important factor affecting households' choices. An understanding of the importance of these factors is relevant in the evaluation of social policies encouraging mothers' participation in the labor market in Italy.

JEL Classification: J2, C3, D1

Keywords: labor market decisions, child care

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1 Introduction

The increase in the proportion of non-parental child care has been the subject of numerous studies since the mid-1970s in the United States, the United Kingdom and Northern Europe. In these countries, the growth in women's participation has been remarkable, especially among mothers of young children. This phenomenon has resulted in an increase in the number of families with children where both parents work outside the home, and has had important implications on child care.

A large body of economic literature on the link between labor supply and child care use is available in most countries, but in Italy (as in other Southern European countries) the issue of child care has been neglected until very recently. This is due, in part, to the fact that the growth in mothers' participation in the labor market in these countries has been more limited than in other countries (Table 1). Italy, along with Spain and Greece, is one of the European countries with the lowest participation rates of mothers with young children. This owes partially to the fact that no national data set provides information on both household member labor market characteristics and child care use.

Italy, however, provides a very interesting case study. On the one hand, as in Northern European countries, public child care is highly subsidized and has high quality standards. On the other hand, in contrast to Northern European countries, public child care has a quite limited number of places available, and is highly regulated in terms of hours and rate of access. Moreover, as opposed to Anglo Saxon countries, the number of private child care services has not increased significantly over the last few decades. A large proportion of Italian families relies on informal child care, and several types of child care are often combined to achieve the desired coverage.

In spite of the growth of the labor market participation of women with children, both the Italian welfare system and the labor market are still characterized by strict rigidities and limitations; in particular, the supply of child care services, whether public or private, has not increased significantly. Especially in the Southern areas of the country, child care services are limited not only in terms of availability but also in terms of opening hours, and the labor market is characterized by a high unemployment rate and by a more limited menu of available employment arrangements. Unemployment rates are extremely high especially among young women, and part-time work, which is very common among mothers in other European countries, is hardly available at all.

In this paper we explore the child care choices made by Italian households, taking into account several characteristics of the different types of child care available for pre-school children under the age of three. We will compare several explanations for the behavior of Italian households regarding preferences and constraints, mainly the parents' attitude towards care for young children and the characteristics of the actual supply of child care services. In order to explore this issue we combine two data sets (ISTAT Multiscopo and SHIW for 1998) to produce data relevant to our analysis, and then we estimate the importance of a number of factors, such as the personal characteristics of the parents, child

care cost and availability and family composition.

In Section 2 we describe the main characteristics of the child care system in Italy and in Section 3 we discuss some potential interpretations for the limited use of public child care, taking into account recent findings from other countries as well. In Section 4 we propose a simple model of child care use on which to base the empirical analysis and Section 5 provides a simulation exercise. Section 6 contains a description of the sample. Section 7 describes the econometric methods used and Section 8 discusses the results of the empirical estimates. Section 9 provides concluding remarks and policy considerations.

Table 1: Female participation rates in selected countries

Country	**1977**	**1999**
Italy	37.6	44.1
France	53.0	59.8
Spain	33.0	47.1
Greece	33.3	47.5
Denmark	64.7	75.1
Sweden	70.0	74.5
U.K.	56.3	67.5

Source: OECD, Eurostat 2001 Statistics in Focus

2 The Child care system in Italy

In Anglo-Saxon countries, where child care services are mostly private, several options are available for child care arrangements. These differ in terms of type, cost and quality, thus offering a greater choice to parents. This diversity creates problems for the study of price responsiveness, however, due to product heterogeneity and unmeasured quality differences in this market (Blau 1991).

In Italy, as in most European countries, public child care is provided by local municipalities. Due to strict regulations, high market barriers to entry and the dominance of public providers, private providers of day care are scarce. However, many forms of rationing are present in the public service. For example, the number of places available in the public sector is very limited. Table 2 shows that Italy, Spain and Greece are the European countries which rely least on child care for children <3. Moreover, the opening hours of public child care facilities are strictly set and are limited to 7-7.5 hours a day (OECD 2000). The availability of child care also varies according to age group and location within Italy. The availability of public care is much higher for children > 3. Child care for children >3 is used by 95 percent of children, while child care for those under 3 is used only by 6 percent. While the availability of child care for children older than three is very uniform across regions, this is not the case for children under three. There are marked differences across regions (Table 3). The proportion of children under three years of age enrolled in public child

Table 2: Proportion of young children using formal child-care arrangements

Country	**Year**	**Aged under 3**	**Aged 3 to mandatory school age**
Denmark	1998	64	91
Finland	1998	22	66
Sweden	1998	48	80
Greece	2000	3	46
Italy	1998	6	95
Portugal	1999	12	75
Spain	2000	5	84
Ireland	1998	38	56
UK	2000	34	60
Austria	1998	4	68
Germany	2000	10	78
Netherlands	1998	6	98
Belgium	2000	30	97
France	1998	29	99
USA	1995	54	70

Source: OECD, Employment Outlook, 2001

care is about 15 percent in some areas of the North, but only 1-2 percent in most Southern areas. Different accessibility rates have created a situation of more significant rationing of child care in some areas of the country, especially in the South of Italy where public child care is characterized by low availability. Nonetheless, private child care is no more widespread than public. Regulations by local public authorities seem to have affected the norms for private child care in addition to public, limiting both its supply and development. Thus, whereas the relative lack of public child care alternatives would seem to leave space for growth of private child care services, this in fact is not the case. Both public and private child care are less widely available in the South than in the North, indicating that public and private options are complementary rather than substitutable (Del Boca 2002). Not surprisingly, as shown in Table 4, the labor market participation rate of women in the Northern areas is about 50 percent, while in the Southern regions it is about 35 (ISTAT 1998) indicating a significant correspondence with child care availability (Chiuri 1999, Addabbo 2002).

Child care costs also vary by age of the child. The cost of child care for children under 3 is much higher on average than the cost of child care for children >3, in both public and private sectors. Unlike private child care, the cost of public care depends on the size, income, and composition of the family. The cost of private and public services varies appreciably across regions. The

Table 3: Child care availability by Italian region (for 100 children))

Region	**Availability (%)**
Emilia Romagna	18.3
Valled'Aosta	12.3
Umbria	11.6
Marche	11.5
Toscana	11.3
Piemonte	10.7
Lombardia	9.7
Liguria	9.7
Lazio	8.5
Friuli	7.8
Trentino	7.5
Italy	**7.4**
Veneto	7.2
Sardegna	6.4
Basilicata	5.2
Sicilia	4.7
Abruzzo	4.1
Molise	2.9
Puglia	2.7
Campania	2.2
Calabria	1.9

Sources: ISTAT: *Annuario Statistico Italiano* 1999-2001; Ministero del Lavoro e delle Politiche Sociali: *I servizi educativi per la prima infanzia*, 2002

amount that parents pay differs from one municipality to another depending on local policies. In particular, public child care provisions differ according to age group: public child care for children < 3 is completely promoted and supported at the municipal level, whilst public child care for children >3 is organized at both the national and local levels. Other important characteristics of the Italian labor market contribute to the difficulties experienced by working mothers in using child care. Part-time jobs are scarce in most areas, while high unemployment makes it risky for mothers of young children to take time off beyond that guaranteed by basic maternity leave. The use of non-parental child care becomes a more important issue for working mothers in areas of low part-time employment. The low availability of part-time opportunities, on the other hand, aggravates the difficulties associated with using the public system, especially due to rationing in terms of opening hours. Another important factor regarding the Italian family allocation of time is related to the fact that on average husbands contribute much less to both household and child care activities than in other countries (Ichino et al., 2003). Given these institutional characteristics, public child care does not seem to be designed to accommodate full-time employment

Table 4: Female participation rates in Italy, by age range and geographic area

Age range	**North**	**Center**	**South**	**Italy**
15-24	43.0	31.3	26.7	33.9
25-34	75.6	62.8	43.8	61.6
35-54	59.0	57.0	42.0	52.7
55-64	14.5	18.5	15.5	15.7
15-64	51.6	46.6	34.8	44.6
65 and more	1.8	1.8	1.6	1.7

Source: ISTAT, Forze di lavoro 1998

of mothers (Gornick et al., 1997). Public child care is thus used by only a small proportion of households and only when it can be supplemented by the extended family or informal child care to compensate for the limitations described above.

3 Child care Choices

Economic studies of choices in child care arrangements in the U.S. and Canada have mainly focused on the choice between private and informal child care. Most of these studies have found a negative effect of child care cost and a positive effect of availability of child care on mothers' participation and child care use. (Blau and Robins 1998, Michalopoulos et al. 2002, Powell 2002, Kimmell 1998, Joesch and Hiedemann 2002, Kuhlthau and Mason 1996, Blau 1991, Johansen et al.,1996). These studies typically assume that the supply of child care is perfectly elastic and child care is a normal good. In other words, such an approach relies on the hypothesis of child care as a well functioning market system where parents have the opportunity to purchase the child care they desire.

Other studies analyzing European data have called into question some of these assumptions in their empirical analyses, and have reported important evidence of market limitations which significantly impact their results. Using time series data, Chevalier and Viitanen (2001) have explored the relationship between child care supply and women's participation in the labor market. They have found that child care "causes" (in a Grangerian sense) participation with no feedback on child care, supporting the claim that women's participation is constrained by the lack of child care facilities and that the supply of child care is, in fact, inelastic. This seems to be particularly true in countries where public child care prevails (such as in most European countries). Other studies have begun to introduce other important elements describing the child care market in Europe, in particular the characteristics of public child care.

Research analyzing the use of public child care has pointed out differences in the various public child care systems. Public child care services tend to be less expensive than private child care (lower income families receive large subsidies) and are widely recognized as being of high quality. Yet despite these attractive features, the use of public child care is quite limited.

Among the several explanations for the limited use of public child care, rationing in the supply of child care is often of key importance. Parents who are willing to purchase public child care may find themselves on a waiting list, access to which depends on their income, working status, family composition and children's health. Furthermore, limited availability implies that not every child is guaranteed a place; moreover, the limit on the maximum number of hours a facility can remain open limits compatibility with the mother's working hours.

These limitations discourage the use of public child care even though it costs less than private services. Gustafsson and Stafford (1992) have investigated the rationing hypothesis, estimating the responsiveness of women's decisions to work and to use public child care in relation to variations in child care cost and availability of places in Sweden. They found that in regions where child care availability does not appear to be rationed, it is the cost of child care which significantly affects mothers' participation in the labor market as well as their choice to use public child care; in areas where rationing is more severe, there is little evidence of significant price effects. Kreynfeld and Hank (2000) have analyzed German data and have argued that analysis of the effects of child care on female employment should focus on the availability of care rather than its affordability. Estimating the impact of access to child care, they found no significant effect of the provision of public child care on female labor force participation, and pointed out inadequacies in German child care. Due to the very limited opening hours mothers using child care may not even be able to work part time and must seek additional forms of child care, which are rarely available. Del Boca (1993, 2002) found similar results for Italy. These results appear to be in contrast with results concerning countries where private child care is the prevalent mode (see Powell 2002 for a review of Canada, and Duncan et al.,2001 for the UK).

Another explanation for the limited use of formal child care is related to family preference (values and gender roles). The traditional role of mothers in child care activities is highly valued by many families, especially in Southern European countries.

According to this view mothers are the best caregivers for young children. In families where this view prevails, parents may choose not to use public or private child care even if the mothers are employed full-time and would be eligible for child care.

Moreover, many families may prefer to rely on the assistance of relatives who they know and trust. In doing so, parents can rely on arrangements that resemble parental care. Reliance on relatives for care reflects an attempt to maintain some stability for children who may suffer from their parents' absence because of participation in the labor market (Hofferth et al., 1991)

Joesch and Hiedemann (2002) have found that even in the US, where a large supply of child care arrangements are available, a considerable percentage of households whose youngest child is under 3 years of age would avoid market child care even if it were free or even if there were no financial constraints. This result is consistent with the hypothesis that non-relative care may be a

Table 5: Hours of formal child care, by working and not working mothers

Hours of school	**not working**	**working**
0	585	374
1-5	2	3
6-8	10	23
9-12	1	2
13-16	7	7
17-20	24	16
21-24	11	11
25-28	9	14
29-32	14	26
33-36	24	31
37-40	14	32
41-45	2	6
46-50	0	5

Source: ISTAT, Multiscopo 1998

non-acceptable alternative for some parents. However, parental preferences for child-care arrangements might change as their children grow up. Some studies show that parents of children under three are more likely to use informal child care arrangements than parents of preschoolers (Hofferth et al., 1991). This difference is attributable either to the reduced availability and higher cost of day care centers for very young children, or to the fact that families prefer informal home-like arrangements for their young children, but then opt for the learning opportunities provided by day care centers and educational programs for their preschool-aged children (Kuhlthau and Mason, 1996).

Another explanation is related to the existence of fixed costs - that is, the costs in terms of transportation, clothing, and stress associated to taking young children to a formal child care center - that do not vary according to the hours of service. The fixed costs are likely to be higher for younger children and in areas where public child care places are few, thus causing higher costs in terms of travel. These costs may discourage parents who are only mildly interested in child care use and who are interested only in using a few hours of care (Joesch and Hiedemann 2002). In the presence of fixed costs, we would expect that most households would either choose to use no care at all or, alternatively, would rely on a significant number of hours of service. Table 5 shows that this pattern does not seem to characterize the behavior of the sample of households in our data set. A non-negligible number of working mothers and non-working mothers only use a few hours of child care. This result seems to imply that fixed costs are not very important here.

4 Behavioral Model

Assuming that women are the principal caregivers in the household, the mother bases her decisions on the costs and benefits of working in the labor market and these will depend on her wage minus the cost of child care per hour worked.

Assume that only women who work use child care and hours of work coincides with child care time. Assuming a utility function of Cobb Douglas (CD) type of the household:

$$U = \alpha \ln L + (1 - \alpha) \ln C \tag{1}$$

The consumption (C) is given by

$$C = Y + (w - \pi)(T - L) \tag{2}$$

in which Y is not labor income, π is the hourly price of child care, w is the mother's wage, T is total amount of time available, L is hours of leisure, and $(T - L)$ is the time of work. The two regimes of child care (public and private) are characterized as follows.

1. Income limit for public child care $\overline{Y}$ (instead of a limited number of slots available).
2. An upper bound of hours $\overline{h}$ in public child care.
3. The prices are determined as $\pi_p < \pi_m$ (where π_p is the price of public child care and π_m is the price of private child care).

The households maximize the values associated with the two regimes which are characterized as follows.

The value of choosing public child care is:

$$V_p(Y, w, \alpha) = \max_{T - \overline{h} \leq L \leq T} \alpha \ln(L) + (1 - \alpha) ln(Y + (w - \pi_p)(T - L)) \tag{3}$$

The value of choosing private child care is:

$$V_m(Y, w, \alpha) = \max_{L \leq T} \alpha \ln(L) + (1 - \alpha) ln(Y + (w - \pi_m)(T - L)) \tag{4}$$

The leisure demand under public child care (L_p^*), without imposing the hour constraint, is:

$$L_p^* = \alpha(Y + (w - \pi_p)T)/(w - \pi_p) \tag{5}$$

The actual $\hat{L}_p$ in presence of the constraints is equal to:

$$\hat{L}_p = \begin{cases} T & \text{if} \quad L_p^* > T \\ T - \overline{h} & \text{if} \quad L_p^* < T - \overline{h} \\ L_p^* & \text{if} \quad T - \overline{h} \leq L_p^* \leq T \end{cases} \tag{6}$$

where $\overline{h}$ is the upper bound on hours in the public child care.

The leisure demand under private care is given by:

$$L_m^* = \alpha(Y + (w - \pi_m)T)/(w - \pi_m) \tag{7}$$

The actual L_m^* in presence of the constraints is equal to:

$$\hat{L}_m = \begin{cases} T & \text{if} \quad L_m^* > T \\ \\ L_m^* & \text{if} \quad L_m^* \leq T \end{cases} \tag{8}$$

The value with the maximum solutions (evaluated at the best choice that can be made in the presence of constraints) for public child care is given by

$$V_p = \alpha \ln(\hat{L}_p) + (1 - \alpha) ln(Y + (w - \pi_p)(T - \hat{L}_p) \tag{9}$$

and for private child care is:

$$V_m = \alpha ln(\hat{L}_m) + (1 - \alpha) ln(Y + (w - \pi_m)(T - \hat{L}_m) \tag{10}$$

In public child care besides the constraint on hours, $\overline{h}$, another constraint concerns the eligibility criterion:

$$\begin{array}{lll} Y_{\ i} \leq \overline{Y} & \Longrightarrow & \text{eligible} \\ Y_i > \overline{Y} & \Longrightarrow & \text{non eligible} \end{array}$$

If $Y_i \ \leq \overline{Y}$ the household chooses public child care if $V_p \succeq V_m$. The child care price is determined only when not eligible and with no constraint on the number of hours.

$$Y_{\ i} \leq \overline{Y} \quad \Longrightarrow \quad p = \pi_m$$

Given the restriction on the number of hours, even if eligible, households who want to work longer hours may choose not to use public child care. As a consequence, the price of child care is not exogenous to the household characteristics. Eligible households face a *menu* of prices, as in the non linear taxation case (Colombino and Del Boca 1990). This implies that the price and hours chosen are jointly determined on the basis of several common factors : Y, w, and the α preference parameter. Therefore, we need to use a model which allows a joint choice of child care cost and participation.

5 Simulation Results

In order to simulate the effects on participation of several characteristics of the child care system (eligibility, hours of service and child care costs) we use information from Multiscopo ISTAT data to set the values of Economy 0, our baseline in term of values per day. We set the value of upper annual family income $\overline{Y} = 25.000$ (Euro) as an indicator of eligibility/availability. The hourly price of public care π_p= 6.5 (Euro). The hourly price of private care π_m= 8.5 (Euro). The preference parameters are drawn from a power function distribution $F(\alpha)$=α^{β}.

We create a data set of 10000 simulated cases. We now run three simple experiments:

- Economy 1 increase in the upper income for child care eligibility
- Economy 2 increase in public child care price
- Economy 3 increase in public child care maximum hours.

Table 6 shows the elasticities of hours of work (and child care) for families who use public, private or the total in response, respectively, to changes in eligibility, public child care price, and maximum public child care time.

Table 6: Elasticities of hours of work and child care

Parameters					**Outcomes**		
	Y	π_p	π_m	h	$\varepsilon(Hp)$	$\varepsilon(H_m)$	$\varepsilon(H)$
Economy0	25	6.5	8.5	7			
Economy1	**40**	6.5	8.5	7	0.537	-0.314	0.021
Economy2	30	**7.5**	8.5	7	-1.190	0.785	-0.194
Economy 3	30	6.5	8.5	**8**	0.436	-0.232	.130

The elasticity of hours of work in response to changes in the eligibility criterion (changing the upper income from 25 to 40), is positive for households who use public child care, while it is negative for households who use private child care. Increasing the eligibility criterion has a positive, if limited, total effect on increasing the number of hours supplied by mothers. The increase in public child care prices reduces the hours of work (and child care) in public care, while it increases the hours of work and service in private care. In terms of hours, public child care prices have a disincentive effect, while the increase in the eligibility criterion and the restriction on hours has a positive one. The increase in the maximum hours of child care increases the hours of work (and child care) in public care and reduces the hours of work of mothers who use private care.

Table 7 shows the effect of these changes on the sub-populations characteristic of various institutional changes that we have described above.

Table 7: Effect of institutional changes on sub-population characteristics

	Y	π_p	π_m	h	Y_p	Y_m	α_p	α_m
Economy0	25	6.5	8.5	7	19.446	181.02	0.145	0.097
Economy1	**40**	6.5	8.5	7	25.513	196.748	0.138	0.095
Economy2	30	**7.5**	8.5	7	19.846	184.830	0.166	0.097
Economy 3	30	6.5	8.5	**8**	19.590	186.807	0.139	0.096

As a result of experiment 1, the average income of households who use public child care increases; that is, more households with higher earnings can now use public services. The preference parameters remain substantially unchanged.

As a result of the second experiment (increasing public child care prices) we observe instead an increase of the preference parameter of mothers who use public care. This is the result of two effects: some women with low α (low preference for work) may leave the market, since it has become too expensive to use public child care. Some women with high α choose the private child care market given that the price of private and public are now about the same, and the former is not restricted in terms of hours.

Finally as a result of the third experiment, that is, increasing the maximum time of public child care, the average income of households using child care does not change significantly, but we observe a decrease of the preference parameter.

In the following sections we will analyze the effect of several aspects of the child care characteristics on family decisions regarding child care, conditional on personal and family characteristics. We will focus on availability/ eligibility and costs since, unfortunately, we did not have access to data concerning the maximum hours of child care.

6 The sample description

Unfortunately, none of the data sets currently available on Italian households contains all the information relevant for our analysis. The Bank of Italy's SHIW contains detailed information on the incomes and wealth of family members, labor market activities, and socio-demographic characteristics of the household but no information on child care (with the exception of a limited section on child care use for 1993). The Multiscopo survey, collected by the Italian Institute for Statistics ISTAT in 1998, provides detailed information on family structure, every-day life, past and present working experiences, use of social services and use of child care. In particular, information on child care use, child care costs, hours of service, and type of child care, i.e. formal (public or private) and informal, is provided. However, the main drawback of this survey is that it does not collect information on household earnings and income.

In order to overcome these limits, we merged the above two data sets using the statistical matching method (see the Appendix for details on the proce-

dure).[1] Data fusion provides a means of combining information from different sources into a single data set.[2] The aim of statistical matching is to match an individual of the Multiscopo with a similar individual of the SHIW according to some particular criteria, in order to collect relevant information from both surveys. In particular, we impute income and earning variables of an individual from the SHIW to a similar individual from the Multiscopo.

The final data set is completed by adding regional information about availability of child care places, unemployment and part-time opportunities.

To analyze the influence of child care on mother's employment, we restrict our sample to married women aged 18 to 45 with spouse present, (so as to exclude those who might still be enrolled in school or retired) and with children in the age range 0-3, since, as mentioned in the previous sections, child care availability and affordability differ significantly for households with children under three. Furthermore, we exclude self-employed workers due to measurement errors in identifying their income and hours of work. This reduces the sample to 7% of the total households interviewed in the Multiscopo survey (from 20153 to 1259 couples).

Table 8 provides descriptive statistics of the sample of household with children aged 0-3.

The geographical distribution of the selected sample has 19.46 percent of the households living in the North-West, 17.08 percent living in the North-East, 16.76 percent in the Center, 33.84 percent in the South, and 12.87 percent on the Islands. In Italy, as in other Southern European countries, female participation in the labor market is low, and this phenomenon is more evident in families with children. More than half of women with children 0-3 (56.0 percent) do not work, while only 44.0 do. This figure suggests that, although Italy is one of the most industrialized countries, a breadwinner typology of the family still prevails, as opposed to an individual and equal role sharing typology (Sainsbury 1996).[3] This figure is consistent with recent findings by Bratti et al., (2003) who show that about 40 per cent of women in Italy are employed within three years after the birth of their first child.

Schooling does not vary much across parents, confirming assortative matching (Del Boca et al., 2003), but differs across working status. The level of education plays an important role in the participation of women in the labor market: 57.0 percent of working women hold a senior high school diploma, and 16.97 percent hold a college degree or higher, whereas the majority of non-working women have a primary and middle school education.

[1] Previous papers in the economic literature dealing with the problem of matching data sets are by Angrist and Krueger (1992), and Arellano and Meghir (1992). They discuss issues concerning identification and estimation of structural parameters from complementary data sources.

[2] Other techniques consist in imputing the missing variables in the main data set by computing a regression model in the secondary data set and then using the coefficients to predict estimates of these variables. In this case, the imputed variables are not values observed on a "similar" individual who participates in the survey, but are simply estimates.

[3] The breadwinner dimension is characterized by an ideology of a strict division of labour (husband = earner, wife=care), with employment that gives priority to men.

As far as child care utilization is concerned, the Multiscopo survey collects information on the type of child care used by children, both formal and informal. Formal child care is intended as using any type of formal providers of care, i.e. public and private, while child care provided by family members or friends on a voluntary basis and/or by baby sitters is classified as informal. Parents choose the forms of child care that are most appropriate for their children, ranging from solely parental care or informal care at home to a non negligible amount of out-of-home child care provided by external sources.

Table 8: Descriptive statistics (means and standard deviations in brackets)

	for children 0-3
Characteristics of child care	
use of public child care*	7.7 (0.25)
use of private child care*	3.1 (0.16)
public regional child care availability	7.0 (3.8)
private regional child care availability	5.8 (6.3)
public hourly child care costs**	6.3 (2.9)
private hourly child care costs**	8.9 (6.3)
Parents' characteristics	
wife works	0.44 (0.49)
age of wife	32.1 (34.6)
wife's schooling	10.9 (3.5)
husband's schooling	10.7 (6.7)
household non labor income***	9.30 (3.03)
Children's characteristics	
number of children	1.7 (0.8)
age of youngest child	1.5 (1.1)
presence of children 4-5 years old	0.14 (0.35)
Family support	
grandmother near and healthy	0.67 (0.46)
husband's hours of housework (per week)	9.5 (10.5)
local financial support	0.02 (0.14)
Labor market	
regional unemployment	12.4 (8.27)
regional part-time	6.8 (1.25)
number of observations	1259

*In percentage points

**In Euro

*** In Euro divided by 1000. The non labor income aggregates income from real and financial wealth, pensions and transfers.

Child care choices vary by the level of the mother's education (Table 9). Highly educated women (with a high school diploma or college degree) use more formal child care for their young children than lower educated women, while they both rely on informal child care to an equal extent.

Table 9: Child care use for children <3 by mothers' education

	Low education	High education	All
Public	3.6	10.8	7.7
Private	1.3	4.4	3.1
Informal	69.2	70.5	69.9
Only parental care	25.9	14.3	19.2

Child care choice also varies significantly by the age of the child and by the mother's working status. Comparing the use of child care of working and non working mothers whose youngest child is under three years of age, it emerges that a smaller percentage of non working mothers uses public care (this could be due partly to the fact that working mothers are given priority in the selection process) (see Table10).

Table 10: Child care use of working and non working mothers (children <3)

	Working Mothers	Non Working Mothers	All
Public	13.0	3.7	7.7
Private	5.8	0.9	3.1
Informal	72.9	67.7	69.9
Only parental care	8.3	27.7	19.2

Only 7.7 percent of households use public services and 3.1 percent use private, while the majority use informal child care. Only 13.0 per cent and 5.8 per cent of households where the wife works use public or private care, whereas the proportion is much lower in households where the wife does not work (only 3.7 and 0.9 respectively). The fact that the use of public and private child care is low might be due either to the rationing in access to public child care or to the limited supply of both public and private child care slots mentioned in section 2.[4] The situation is completely different if we consider pre-school children aged 3-5. Table 11 shows the proportion of type of use for children in this age group.

[4]Even if the situation regarding the provision of formal child care has improved in the last decade, there is still a shortage of supply of formal child care services.

Table 11: Child care use of working and non working mothers (3-5)

	Working Mothers	Non Working Mothers	All
Public	63.4	61.5	62.3
Private	25.2	16.2	20.2
Informal	10.7	16.6	13.9
Only parental care	0.6	5.8	3.6

For children older than three, formal child care is used not only by working mothers, but also by a high proportion of non-working mothers: since a large proportion of Italian children have no siblings, child care centers are seen as an opportunity for education as well as socialization.

Concerning child care costs, the incidence of child care spending by household income decile is higher in the low income decile.[5] In addition, child care costs are higher in the North than in the South, and in the private sector than in the public sector. Table12 shows the average expenditures for child care (for the sample who pays) by region and type of child care for children <3.

Table 12: Child care expenditures (per month)

	Public school	Private school
North-West	195.3	309.8
North-East	187.2	232.9
Centre	160.3	193.7
South	52.7	108.2
Isles	53	86.1

In the analysis that follows we first jointly estimate the probability that a mother works and uses formal child care; then, we analyze the choice between alternative modes of child care. The following groups of variables are used as controls in the estimates:

- Characteristics of child care: availability of places[6] and costs.
- Socioeconomic characteristics of husbands and wives (age, schooling and total household non labor income).
- Children's characteristics (number of children, age of youngest child, and presence of children aged 4 to 5 years),

[5] Figures are available on request from the authors.

[6] Availability is calculated as the ratio of the number of child care places available for children 3 or less to the number of children 3 or less by area of residence.

- Family support variables (presence of a grandmother living near the family and healthy, help from the husband with the housework, local public financial support).
- Environmental variables of the labor market (regional unemployment rate and part-time[7]).

7 Estimation Methods

In the first part of the analysis, we use a bivariate probit model to jointly estimate the probability of woman being employed and of purchasing formal child care (both private and public). Since participation and child care choices are simultaneously determined, they have to be estimated jointly. The dependent variables in the bivariate model are whether the wife is working at the time of the interview and whether or not she is using formal child care. This estimation should shed some light on the household decision process concerning both type of choices and also on the relevance of local labor market and child care characteristics.

We assume that the two decision processes can be described as two latent index models:

$$\begin{aligned} Y_{1i}^{*} &= X_{1i}\beta_1 + u_{1i} \\ Y_{1i} &= 1 \;\; if \;\; Y_{1i}^{*} > 0, \; 0 \;\; \text{otherwise} \end{aligned}$$

where Y_{1i}^{*} is the probability of the mother's decision to work and

$$\begin{aligned} Y_{2i}^{*} &= X_{2i}\beta_2 + u_{2i} \\ Y_{2i} &= 1 \;\; if \;\; Y_{2i}^{*} > 0, \; 0 \;\; \text{otherwise} \end{aligned}$$

where Y_{2i}^{*} is the probability of that the household will choose to use formal child care. Typically, it is assumed that:

$$\{u_{1i}, u_{2i}\} \sim \phi_2 \left(0, 0, 1, 1, \rho\right)$$

where ϕ_2 is the bivariate normal density distribution and ρ is a correlation parameter denoting the extent to which the two errors covary. If $\rho \neq 0$, it denotes that the two decisions are simultaneously taken.

We are interested in estimating the following probabilities:

$$\Pr\left(Y_{1i} = 1, Y_{2i} = 1\right) = \int_{-\infty}^{u_{1i}} \int_{-\infty}^{u_{2i}} \phi_2 \left(X_{1i}\beta_1, X_{2i}\beta_2, \rho\right) du_{1i} du_{2i} = \Phi_2 \left(X_{1i}\beta_1, X_{2i}\beta_2, \rho\right)$$

[7] The variable "regional part-time" is an indicator of the probability of locating a part-time job, computed as the ratio of the number of part-time jobs to total employment in the region.

Then, the likelihood function for the bivariate probit is just the sum across the four possible transition probabilities (the four combinations of Y_1 and Y_2).

In the second part of the analysis, consistent with the model outlined in section 4, we focus on working mothers for whom the use of external child care is often a necessity rather than a choice. In particular we estimate the probability of choosing among three different modes of child care by using a multinomial logit model.

The reference alternative consists of mothers using informal child care or using only parental care. The remaining two alternatives are using public child care and using private child care.

In the multinomial logit, the *i-th* mother's utility if she chooses child care choice state j is given by:

$$V_{ij} = \sum_j \beta_{Cj} C_{ij} + \beta_{Xi} X_i + \epsilon_{ij}$$

where *j=1,2,3* (respectively public child care, private child care and informal or parental care), C_{ij} are characteristics of the mode of child care at the regional level (regional child care prices and availability), and X_i is the vector of observed individual/household characteristics. To be consistent with the previous notation, let Y_{2i} be the indicator function that denotes which option has been chosen by the mother i:

$$Y_{2i} = j \quad \text{if } i \text{ chooses } j$$

Mothers are assumed to maximize utility and therefore:

$$Y_{2i} = j \quad \text{if} \quad V_{ij} > V_{is} \quad \text{for all s} \neq \text{j in the choice set}$$

then the probability that state j is chosen by mother i is given by:

$$\begin{aligned} & P_{ij} = \Pr\left(Y_{2i} = j\right) = \Pr \text{ob}\left(V_{ij} > V_{is}, \forall\ s \neq j\right) = \\ = \quad & \frac{\exp\left(\sum_j \beta_{Cj} C_{ij} + \beta_{Xi} X_i\right)}{\sum_j \left[\exp\left(\sum_j \beta_{Cj} C_{ij} + \beta_{Xi} X_i\right)\right]} \end{aligned}$$

where it is assumed that ϵ_{ij} are independent and identically distributed according to the extreme value cumulative distribution $\exp(-e^{-\epsilon_{ij}})$. In general, the parameters of the omitted category are set to zero, and therefore each coefficient indicates the change in the probability of that outcome, relative to that of the omitted category, associated with a change in the independent variable. The multinomial logit is then estimated by using maximum likelihood methods. The Extreme-Value distribution imposes the independence of irrelevant alternatives (IIA) assumption, according to which any pairs of choices are independent from all the other choices. The validity of this assumption is tested by Hausman's specification test.[8]

[8] Hausman's test suggests that the omission of an irrelevant choice set should not change

8 Empirical Results

We first present the results from the estimation of the joint probability of woman to be employed and to purchase formal child care, including both the availability and costs of child care. Regarding the child care cost variable, we have a problem of self-selection. In fact, we only observe the child care costs paid by each household who uses formal child care, but not the child care costs for all the mothers in the sample. Therefore, we would need estimates for those mothers not using any type of formal child care. One solution would be to estimate a child care price equation by using the Heckman two-step procedure to predict prices for the whole sample,[9] but this would require an exclusion restriction assumption. In order to avoid making strong assumptions, we use regional public and private child care costs instead, which are a proxy for the price potentially faced by each household in the sample.

Table 13 shows the parameter values and the standard errors for the joint estimation of the two decisions for households with pre-school children aged 0-3.

Table 13 shows that the wife's participation decision is influenced by her personal characteristics; the higher the wife's educational attainment the more she is likely to work. Both the wife's and the husband's schooling have a positive impact on the utilization of formal child care: the higher the level of the parents' education, the more they value the effect of socialization and the services provided by the child care. Several studies have suggested the possibility of a more diversified relationship between parental work and child care choices depending on the role of the educational level of the parents (Hill and Stafford 1980, Leibowitz 1988). As expected, higher local support from the municipality significantly reduce the women's probability of working (Colombino and Del Boca 1990, Colombino and Di Tommaso 1998).

The number of both pre-school and school children has an expected discouraging effect on a woman's decision to work, whereas the age of the youngest child does not seem to be relevant. This lack of significance can be attributed to the fact that mothers in Italy can take maternity leave up to their child's 1^{st} birthday. During the child's first year, mothers may be more reluctant to use formal care and may prefer to take care of their own children. When analyzing the effect of having a grandmother living nearby, we find a positive impact on the probability of the wife's working and a negative impact on the probability of using formal child care (but this last effect is not significant). These results indicate that grandmothers are probably considered substitutes for formal child care when this is unavailable or not preferred. These results confirm earlier results by Del Boca (2002) and Chiuri (1999)[10]. The help from another member of the family also appears to be important: having a husband contributing to

the parameter estimates since the odds of two alternatives do not depend on the other existing alternatives (Hausman and McFadden, 1984).

[9] See Connelly (1992), Ribar (1992) and Michalopoulos and Robins (2000).

[10] The presence of a healthy grandfather near-by is never significant and for this reason is not included in the analysis. However, its exclusion affects neither the magnitude nor the significance of the other coefficients.

Table 13: Bivariate Probit Mothers' Work and Child care use (Std.Err. in bracket)

	Work	Child care
Characteristics of child care		
public regional child care availability	-0.004	0.030
	(0.017)	(0.023)
private regional child care availability	0.009	-0.008
	(0.008)	(0.011)
public hourly regional child care costs	-0.012	-0.028
	(0.015)	(0.019)
private hourly regional child care costs	0.004	-0.008
	(0.008)	(0.011)
Socioeconomic characteristics		
Age of wife	0.058**	0.025∼
	(0.010)	(0.014)
Wife's schooling	0.123**	0.064**
	(0.015)	(0.019)
Husband's schooling	-0.015	0.033∼
	(0.013)	(0.017)
Household non labor income	0.032*	0.013
	(0.014)	(0.017)
Children's characteristics		
Number of children	-0.181**	-0.024
	(0.059)	(0.079)
Youngest child 0-1	-0.075	-0.453**
	(0.080)	(0.112)
Presence of children 4-5 years old	-0.093	-0.015
	(0.122)	(0.159)
Family support		
Grandmother near and healthy	0.439**	-0.124
	(0.087)	(0.110)
Husband's hours of housework (per week)	0.019**	0.010*
	(0.004)	(0.005)
Local public financial support	-0.946*	0.337
	(0.390)	(0.367)
Labor market		
Regional unemployment	-0.034**	-0.010
	(0.011)	(0.016)
Regional part-time employment	0.135**	0.089˜
	(0.039)	(0.053)
Constant	-4.119**	-3.545**
	(0.491)	(0.656)
rho	0.349** (0.066)	
log likelihood	-1021.457	
number of observations	1259	
(** significant at 0.01 level; * significant at 0.05 level; ˜significant at 0.10 level)		

the housework activities significantly increases the wife's probability of working (making it easier for her to reconcile work and family). The husband's assistance with the housework (including care of the children) also has a positive effect on the probability of using formal child care, indicating the importance of having a family support system that compensates for the rigidities in the hours supplied by formal child care (mainly public). According to recent findings by Ichino and Sanz de Galdeano (2003), fathers in Italy dedicate less time to child care when the mother does not work than in other countries, but when the wife works, their contribution increases. This is different from other countries such as Germany and Sweden, where the fathers' behavior does not change significantly whether the wife works or not. This is probably due to the fact that relatively few women work in Italy and the sample is highly selected.

As expected, the condition of the local labor market proxied by the regional unemployment rate negatively influences women's labor participation: in areas where the rate of unemployment is higher, women are less likely to work, although there is no significant effect on child care use. The other indicator of the labor market condition, i.e. the availability of part-time jobs, positively affects the wife's participation decision and the use of formal child care, suggesting that reduced workload could be of help in buffering the rigid constraints on the opening hours of public child care.

Finally, child care characteristics in most cases have the expected sign, but the effects are not statistically significant. Higher costs of public or private service discourage the use of formal child care. Higher availability of public child care increases the use of formal care while the opposite holds true for private child care. This last effect could be due to the high costs of the private service which limit its use despite availability.

The coefficient of correlation between the errors of the two equations is positive and strongly significant, thus indicating the simultaneity in the choices of female participation and use of market child care; demographic and household characteristics, rather than child care characteristics, mainly affect child care decisions.

Consistent with the model outlined in section 4, we now focus on the child care choices of working mothers, with informal child care as the reference category. In particular, the key objective of this analysis is the choice by working mothers about the type of child care to use, conditional on personal, family and child care market characteristics. As discussed above, many working mothers rely on informal child care. For this reason we consider three different modes of child care used prevalently by working mothers as the primary mode of child care: 1) public child care, 2) private child care, 3) informal plus parental child care.

The results are presented in Table 14. The variables considered here are: demographic and socioeconomic characteristics of husbands and wives; household composition variables, variables indicating the availability of family support, and finally, variables describing the characteristics of public and private child care.

Table 14: Multinomial Logit - Child care Choices in Households where wives work (Reference category: informal)

	Children 0-3	
	Public	Private
Characteristics of child care		
Public regional child care availability	0.140**	0.089
	(0.055)	(0.083)
Private regional child care availability	-0.021	0.007
	(0.027)	(0.045)
Public hourly regional child care costs	-0.014	-0.339**
	(0.080)	(0.111)
Private hourly regional child care costs	-0.014	0.020
	(0.026)	(0.048)
Socioeconomic characteristics		
Age of wife	0.008	0.030
	(0.038)	(0.059)
Wife's schooling	0.107∼	0.122
	(0.056)	(0.086)
Husband's schooling	0.024	0.098
	(0.048)	(0.072)
Household non labor income	-0.057	0.085
	(0.052)	(0.061)
Children's characteristics		
Number of children	0.187	-0.001
	(0.230)	(0.342)
Youngest child 0-1	-0.792**	-0.524
	(0.309)	(0.461)
Presence of children 4-5 years old	0.705~	-1.261
	(0.391)	(0.864)
Family support		
Grandmother near and healthy	0.299	-1.321**
	(0.329)	(0.444)
Husband's hours of housework (per week)	0.006	-0.004
	(0.012)	(0.019)
constant	-4.585**	-5.132*
	(1.479)	(2.104)
log likelihood	-263.333	
number of observations	553	
(** significant at 0.01 level; * significant at 0.05 level; ~significant at 0.10 level)		

While the mother's age does not seem to affect the choice of child care, her education positively affects the choice of public care for children 0-3. This is consistent with the fact that more highly-educated mothers place greater value on the services provided by regulated child care settings (the opportunity for socialization with other children, relationship with teachers, etc.). We find that the age of the youngest child (0-1) significantly reduces the probability of using public child care, reflecting both the aversion to this type of care when the child is young as well as the opportunity to take parental leave during the first year. This result is consistent with the view of mothers as the best caregivers, especially for very young children. Two effects are likely identified: when the child is very young, parents may face more rationing and, at the same time, face higher costs for taking infants to child care, inducing parents to look after their own children. Child care centers, both public and private, are considered more appropriate for older children because the social setting enhances older pre-schoolers' socialization, but not enough attention is given to very young children. Instead, having additional children of pre-school age makes it easier to gain access to public child care (given the eligibility criteria of the priority list). In fact, the presence of children of pre-school age (4-5) has a positive impact on the probability of using public child care.

The variables related to family support (by the grandmother and husband) have opposite signs on the probability of using public or private care (positive in the first case and negative in the second) although it is significant only in private care.

As far as child care characteristic variables, we find that demand for public school is positively influenced by the access rate. Where the supply of public child care is more widespread, the demand for the public service increases significantly. Instead, even if the access rate to private child care is facilitated, there is no influence on its use, probably due to higher costs. Public child care costs instead greatly reduce the probability of using formal care, but the coefficient is significant only for private care. This seems to indicate that private child care in Italy is not a substitute/alternative to the public service, given that it is regulated by similar rules; in any case, some substitutability between informal and private care does seem to exist (Saraceno, 2003).

Overall, our results show that public and private child care are not substitutes, but share similar characteristics. Rationing of public service proves to be a significant factor affecting public child care choices, while public costs only affect choices concerning the private service. Neither availability nor costs of the private service significantly affect the child care choices of working mothers. The Hausman test of the IIA assumption was performed and showed no evidence for violation of the IIA assumption.

Finally, Table 15 presents child care availability and price simulations based on the bivariate model presented in section 7 to assess the degree to which government intervention in the form of an increase in public availability or child care subsidies simultaneously impact labor supply and child care decisions.

The empirical estimates reported here prove useful in discussion of policy implications. The "base case" probabilities are those predicted by the model

Table 15: Simulation of Employment-Formal child care choice (FCC)

	work/ use FCC	work/ not use FCC	not work/ use FCC	not work/ not use FCC
Baseline (availability=7, costs=6.68)	*0.072*	*0.367*	*0.023*	*0.538*
public regional child care *availability (mean=64)*	0.267	0.106	0.261	0.365
public regional child care *availability (mean=48)*	0.233	0.158	0.177	0.431
public hourly regional child care *costs (-20%)*	0.076	0.367	0.024	0.532
public hourly regional child care *costs (-80%)*	0.092	0.366	0.029	0.512

with no simulated changes. Table 15 shows that an increase in public child care availability from 7% to the average of Danish child care (64%) or to the Swedish one (48%) would induce many women to shift from not using formal child care to using it independently of their working status. In fact, the probability of working and using formal child care would increase from 0.072 (the baseline) to 0.267 (the simulated case), while the probability of working and not using formal child care would decrease from 0.367 to 0.106. If the increase in public child care availability is limited to 48% (the figure for Sweden), the increase in the probability of working and using formal child care is still relevant (from 0.072 to 0.233).

On the contrary, when public child care is subsidized by reducing its costs by 20%, the changes in the probability of working and using formal child care are negligible. Even if public child care is almost entirely subsidized by reducing its costs by 80%, the changes in probabilities are very modest. The simulation results show that government interventions have different effects on employment and choices in child care. For instance, child care subsidies are found to have a negligible effect on employment and the use of formal child care, while an increase in availability has strong effects on the joint decisions. Thus, from a public policy perspective, the simulation results point to a clear need to increase the provision of available slots in public centers (and reduce the regulations also affecting private child care) in order to reduce the constraints affecting labor supply and child care choices of mothers of young children.

9 Conclusion

In this paper we have analyzed Italian households' choices concerning child care for preschoolers and discuss several interpretations for the phenomenon of low use of public child care. We first presented a simulation exercise of an increase in availability of public child care and its costs. The increase in availability results in an increase in the use of public and the reduction of the use of private care. In contrast, an increase in public child care costs results in an increase in private use and a reduction in public use. These results are consistent with a

well-functioning child care market where child care demand is elastic in response to prices.

Unfortunately, our econometric analysis is limited by the limited size of the sample available after several selection processes. This limitation has been taken into account when discussing the empirical results. Our exploratory analysis shows that the demand for public child care is positively influenced by access costs. When access to public child care is easier and the supply of public child care greater, the demand for public services increases significantly. Instead, even if the availability of private child care increases, its use is not significantly influenced, probably due to higher costs. This finding suggests that the substitutability between public and private services is limited: when public child care costs increase, mothers tend to rely more on informal care rather than switching to private care. This indicates that private child care in Italy is not a substitute/alternative to the public service but shares similar characteristics and regulations.

Furthermore these results suggest that child care cost is less relevant when the system is characterized by a predominance of public provisions (even if the supply covers only about 25% of the demand) and of a rather limited private market which is regulated in a similar fashion to public care, although at higher prices.

Our analysis of other factors describing family characteristics shows that less educated parents are less likely to use formal child care and tend to prefer informal or "direct "child care, especially when children are less one year old and it is possible to use parental leave for at least part of that time. Larger families with older children (4-5 years of age) tend to prefer public child care since it is more affordable and easier to access. Family support is also important in encouraging mothers' labor market participation (reducing housework and child care responsibility) and seems to affect the use of private child care.

These results are important for understanding of how the Italian child care market works. They are useful in evaluating the effectiveness of the market in supporting mothers' choices to participate in the labor market during their childbearing years, and help explains parents' child care decisions. They also offer important insights for effective policy development aimed at providing an adequate and affordable supply of child care in order to meet the demand of Italian households. This is particularly important in the current context, where a growing number of families have only one child and a growing number of mothers would like to continue working throughout their child-bearing years.

10 Appendix - Statistical matching

The purpose of this section is to explain how the statistical matching was performed. First, two constraints must be satisfied to make matching feasible: i) the two surveys must be random samples from the same population;[11] ii) there must be a common set of conditioning variables. In our case, the first condition is met by design, since both the Multiscopo 1998 and the SHIW 1998 data are representative of the Italian population. The second condition is satisfied after some recoding.

To satisfy the second constraint, we need to define a function which measures the "*similarity*" between the individuals of the two samples and which assigns to each individual of the Multiscopo set a similar individual from the SHIW, according to some particular criteria. Each pair of individuals created according to this procedure will give origin to an integrated record, with the relevant information from both surveys.[12]

In this case, we have selected married couples with both partners present. Next, we took into consideration only women who are housewives, unemployed, students or employed; in addition, they had to be married to men who are either unemployed, retired or employed.[13] This reduces the sample to 3140 couples belonging to the SHIW survey and to 8347 from the Multiscopo survey. In order to impute non labor household income, the total sample of 11487 households is used. When the labor earnings and hours of work from women of the SHIW survey to women of the Multiscopo survey have to be imputed, the statistical matching is realized only on women who work (1122 from ther SHIW and 3039 from the Multiscopo) to further reduce imprecision.

As a baseline analysis, we compare the averages for all of variables the two surveys have in common. We compute descriptive statistics for women and for men related to selected variables from the two surveys (members, number of children in different age groups, age, education, area of residence).[14] Within the Multiscopo set, young children and larger families are over-represented, as are young and less-educated women and men. Those having a permanent job are only slightly over-represented. A significant percent of working women have working partners. Finally, those living in the center of Italy are significantly under-represented compared with the SHIW survey. For occupational qualifications and sector of activity, most of the differences between the two surveys

[11] However, even if the samples have different compositions and it is not reasonable to assume that they are drawn from the same population, it is still possible to proceed in matching them by choosing one data set as the recipient (usually the most representative) and the other one as the donor. The final integrated data set will be representative of the recipient dataset's population.

[12] However, it is not possible to generate *one-to-one* matching because the two surveys are of different sizes; we only impute the relevant information taken from an individual of the SHIW survey to an *almost* identical individual belonging to the Multiscopo survey.

[13] We exclude self-employed workers in order to have a more uniform sample for the matching procedure, and retired women because they are not relevant to the problem at hand (child care opportunities for very young children). In particular, the number of retired women with very young children is negligible and we argue their elimnation should not bias the results.

[14] Descriptive statistics and comparisons are available on request from the authors.

are not significant.

The next step could be to match units from the two surveys, conditional on the common variables X. However, this procedure is problematic when the vector of common variables is large, as in this case. Rubin (1977) and Rosenbaum and Rubin (1983) suggest using as an alternative the conditional probability of belonging to a sample, e.g. the Multiscopo sample, for purposes of stratification. This is the so-called *propensity score,* computed as $p(X_i) \equiv \Pr(i \in Multiscopo \mid X_i = x)$.[15] Therefore, matching can be performed on $p(X_i)$ alone, thus reducing a potentially high dimensional matching problem to a one dimensional problem.

In order to compute the propensity score, we have run a probit regression of the binary indicator taking value 1 for observations in the Multiscopo sample (and 0 for the SHIW sample) over the set of above-mentioned common household characteristics plus some interaction terms.[16] Since the propensity score is a continuous variable, exact matches will rarely be achieved and a certain distance between individuals belonging to the two samples has to be allowed. Thus, we chose to use the *radius method of matching*; among the units within the radius, we randomly select one unit, and we repeat this procedure 20 times. The final value of each imputed variables is obtained by averaging the 20 values previously obtained.[17] After the statistical matching is performed, each individual from the Multiscopo will be imputed the annual labor earnings, the annual hours of work and the household non labor income of a similar individual from the SHIW according to the value of the function of the propensity score.

Finally, we proceed with an internal evaluation of the statistical matching. We first compare the average values between the values of the imputed variables after the matching and the corresponding average values in the donor set, i.e. the SHIW sample. For working women, the total number of hours worked differs between the two samples by 2.8%, while the total annual earnings differ by 2.0% and are not significant at conventional levels of testing; the difference of household non labor income between the two groups is 5% and not significant at 10%.

Next, we evaluate the preservation of relations between variables. For each common variable, we compute the correlation with the imputed variables, for the fused data set (Multiscopo variables plus labor earnings, hours of work and

[15] They show that by definition individuals belonging to two different groups but with the same value propensity score have the same distribution of the full vector of observable X_i.

[16] The choice of interaction or higher order term to include for estimating the propensity score is determined solely by the need to obtain an estimate of the propensity score that satisfies the *balancing property* (see Dehejia and Wahba, 1999). To build the propensity score we follow the algorithm proposed by Dehejia and Wahba (1998). We end up with 11 blocks when we impute women labor earnings and hours of work and 13 blocks when we impute household labor income; in each of them the score was balanced across the treated blocks and controls. Then, within each block, we test for equality of means between the treated and the control groups for each of the variables in X_i. In almost every case we find equality of means of the X_i at the 10% confidence level, and none of the covariates systematically fails the test in all the blocks.

The results are not reported, but are available on request from the authors.

[17] The standard errors are computed by bootstrapping.

household non labor income variables) and for the donor set. The differences between the common-fusion correlations in the SHIW data set versus the fused Multiscopo data set seem to be well preserved for most variables.

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