The effect of grandparental support on mothers' labour market participation: an instrumental variable approach

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ABSTRACT

Mothers' Labour Market Participation:
Do Grandparents Make It Easier?

Childcare arrangements are key in women's ability to juggle motherhood and working outside the home. As such, the study of the access to childcare and its use is of great policy relevance. We focus on a particular kind of informal childcare, the one provided by grandparents. Empirically, assessing the effect of grandparental childcare is not an easy task due to unobserved preferences. In light of the potential outcome framework, we interpret the biases resulting from unobserved preferences as arising from the non-compliance of mothers to the availability of grandparents and from preferences of grandparents for activities other than childcare. Using an Instrumental Variable approach on Italian data, we find that the effect of grandparental childcare on mothers' labour supply is positive, statistically significant and economically relevant. The effect is stronger for lower educated mothers, with young children and living in the North and Centre.

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1. Introduction

Childcare arrangements are a key element in the work decisions taken by mothers insofar as they are fundamental to the ability of women to juggle childcare and participation in the labour market. In the traditional economic models of female labour supply, where formal childcare is usually conceptualized as being provided by the market, childcare costs are seen as the key variable in women's decision about participation in the labour market. These models predict lower childcare costs to result in higher female labour force participation (Kimmel, 1998), and several studies provide empirical evidence of this relationship (see Blau and Currie (2006) for a review).

However, many families turn to an informal type of childcare, the childcare provided by relatives, which usually does not involve monetary costs. Even though Heckman called attention to this fact in his pioneering paper on this field (Heckman, 1974), there are very few empirical studies analysing the effect of grandparental childcare in women's work decisions (Dimova and Wolff, 2008, 2011; Compton and Pollak, 2011; Aassve et al., 2012). Grandparental childcare is particularly common in the Mediterranean countries characterized by strong family ties (Dalla Zuanna, 2001). Whereas the percentage of grandparents providing some help with childcare is high throughout all Western Europe, the proportion providing regular childcare (almost weekly or more often) in Southern Europe is almost double that of the Nordic countries (Hank and Buber, 2009). This difference accentuates if one looks at the percentage of grandparents who provide care on a daily basis: around 30% in Italy and Spain *versus* 15% in Germany and Austria and only 2% in countries like Denmark and Sweden[1].

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[1]Authors' calculations from the 2004 wave of the SHARE data.

Although we are looking at the Italian case, one might expect grandparental childcare to affect women's work decisions wherever childcare is either not free or not universally available. In fact, the Italian case is particularly interesting because Italy has one of the lowest female labour market participation rates among the OECD countries.

In the present context the topic of this paper is of particular policy relevance. The European policy goal of delaying retirement to ensure the solvency of pensions plans is accompanied with that of increasing women's labour market participation, set by the Lisbon strategy. However, these two goals are, to some extent, contradictory as delayed retirement might be at odds with the availability of grandparents to provide childcare - especially in countries where a large proportion of the population relies on childcare provided by grandparents (usually grandmothers). In the U.K., where around one quarter of parents makes use of grandparental childcare (Glaser et al., 2010), there has been pressure for the recognition of the role of grandparents as providers of childcare. As of 2011, grandparents who give up paid work to provide childcare can claim credits which allow them to qualify for a full basic state pension.

The empirical analysis of the effect of grandparental childcare on female labour force participation is complex due to endogeneity issues. It is not possible to exclude the possibility that there are unobserved preferences related both to childcare and labour market decisions. We use the potential outcome framework (Neyman, 1923; Rubin, 1974) to formalize the problem. Our econometric approach uses as instrumental variables information on whether grandparents are alive to exogenously predict the probability of using grandparental childcare. We discuss what is estimated under different approaches

and, in light of this, we contrast our results to the few related empirical works in the literature.

Our results show that the effect of grandparental childcare on mothers' labour supply is positive, statistically significant and economically relevant. Moreover, we find the effect to be heterogeneous: the benefit of grandparental childcare is stronger for mothers with low education, with young children, living in Northern and Central Italy. Differently from other papers using an IV approach, we present tests and robustness checks to support the credibility of our Instrumental Variables.

2. Data and variables

The data we use are drawn from the Multiscopo - Famiglie e Soggetti Sociali (Families and Social Subjects) survey[2], collected in 2003, and released by the Italian National Institute of Statistics (ISTAT). Multiscopo is the main source of information in Italy on the structure and social characteristics of the family, which makes it particularly well suited to study the relationships among family members (including with those living outside the household), childcare decisions regarding young children and leaving home decisions of older children and marriage and fertility intentions, for example. Regarding grandparental childcare, a key advantage of the Multiscopo is that it not only provides information on its use but also on its frequency. Therefore, it is possible to know who uses grandparental childcare on a regular basis - which we define as at least twice a week[3]. Unlike other surveys that have been used to study grandparental childcare,

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[2] The non response rate is about 12%. For further details on the Multiscopo surveys, see ISTAT (2006).
[3] We tried different categorisations but the main results (section 6) remain qualitatively the same.

Multiscopo includes mothers whose parents have deceased, rendering our identification approach feasible.

Multiscopo collected information on 19,227 Italian families of which 4,206 have at least one child younger than 14 years old. Only mothers in a couple who had at least one child younger than 14 years old (3,869 observations) were selected. Single mothers were excluded due to the greater complexity in the reconciliation of family and work they face compared to mothers in couples[4]. Ideally we would treat single mothers and mothers in a couple separately, instead of excluding the former, but there are not enough cases. After dropping the very few observations with missing values in each of the variables used in the model, the final sample is composed of 3,852 mothers.

The employment status of the mother is defined as working or not. As we can see from Table 1, the labour force participation rate is 66% among mothers that use grandparental childcare and only 42% for the others.

Another important advantage of the Multiscopo compared to, for example, the SHARE survey is that there is plenty of information on the middle generation (the mother and her partner) and their children. This allows us to consider a set of control variables concerning the mother, the father, and the whole household such as age and age squared of the mother, education of each of the parents (dummy variables indicating tertiary and secondary education; less than secondary education is the reference category) and two variables summarizing the fertility history of the couple: the number of children under 14 years old and whether the youngest one is in pre-school age (3 years old or less).

Availability, quality and cost of formal childcare varies substantially across the Italian regions (Del Boca, 2002). These factors might influence the probability to receive

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[4] For an overview on single motherhood and childcare choices see Raeymaeckers et al. (2008).

grandparental childcare and can also be associated with labour market conditions (e.g., unemployment rate), which in turn could influence female labour force participation. Moreover, Jappens and Van Bavel (2012) find that mothers' child care choices are related to the family practices and norms prevailing in their region of residence and these vary within the same country. Therefore, we also include in the analyses a set of dummy variables for the region of residence.

Table 1 presents descriptive statistics for the variables used in the analysis both for the whole sample and, separately, for mothers using and not using grandparental childcare. The sample is composed of relatively young mothers (average age is 37 years old) whose parents are, by and large, still alive. There are no noticeable differences in the average characteristics of the two sub-samples (mothers helped and mothers not helped by grandparents), except for the percentage of mothers working. Participation in the labour market is higher among mothers helped in child care by grandparents. Mothers who are not helped are somewhat older and have older children, but the differences are small.

3. The endogeneity of grandparental childcare

Motherhood certainly affects the value women place on their time at home (Blau and Ferber, 1992) but the extent to which this happens depends on women's preference regarding the "externalness" of childcare (El-Attar, 2007) i.e., the stronger is the preference for taking care of the children themselves (the most internal type of childcare) the higher is the reservation wage. This preference type is probably most often observed in contexts where family ties are strong and where wages and employment rates are low

(Alesina et al., 2010). On the other hand, women who have a stronger preference towards participating in the labour market must be willing to use a more external type of childcare. Within this group of mothers there might still be substantial heterogeneity. If in some cases, grandparental childcare is considered as a substitute for formal childcare - a cheaper one- there might be other reasons leading parents to have grandparents looking after their children. For example, concerned about childcare quality, some parents might have a preference against it (Ham and Buchel, 2004; Parera-Nicolau and Mumford, 2005) and would not use non-relative care even if it was free (Ermisch, 2002). Hence, while some working mothers might choose the next more internal childcare type, grandparental childcare, others might trust formal childcare and send their children to this most external type of childcare – preferring it to grandparental childcare on the grounds of the benefits of formal childcare with respect to child development, for example (Felfe and Lalive, 2010; Brilli et al., 2011; Havnes and Mogstad, 2011).

Figure 1 summarizes graphically the previous discussion. Let us start by assuming that "externalness" is positively associated to mother's willingness to participate in the labour market. Then, consider two groups of mothers who both have preferences "against" grandparental childcare: group A, which includes those with a strong preference for caring for the children themselves, and group B that includes those who prefer formal childcare. In between these two extremes are mothers who are willing to accept help in childcare from grandparents. Up to a certain threshold, τ, the preference for external types of childcare is positively associated with the probability to accept grandparental childcare because mothers accept to externalise childcare to grandparents. After this point, the relationship turns negative because for high levels of "externalness"

mothers start preferring formal to informal childcare. As a result, unobserved preferences introduce a positive bias in the relationship between observed grandparental childcare and labour market participation for values of "externalness" below τ. The sign of the bias turns negative for values above τ.

The combined effect of the positive correlation between "externalness" and labour supply and the non-linear effect on grandparental childcare will produce an overall a upward or downward bias depending on which effect prevails: that of women with a preference for the most internal type of childcare or that of women who prefer an external type of childcare.

Another potential source of bias are grandparents' unobserved characteristics. Grandparental childcare depends on their willingness and ability to do so. It might be that in some cases no childcare is provided by grandparents because they are not willing to forgo their leisure time or retire early in order to take care of their grandchildren. These less traditional grandparents are likely to have less traditional children as well and, consequently, their female children are likely to be participating in the labour market. Indeed, Farré and Vella (2012) find that women's attitudes significantly affect her children's views towards working women and that this cultural transmission influences female labor market decisions. If these unobserved preferences are not taken into account, the effect of grandparental childcare in mother's labour market participation might be downward biased.

4. Methods

We use the potential outcome framework (Neyman, 1923; Rubin, 1974) to formalize the statistical issues involved in estimating the effect of grandparental childcare on the labour force participation of mothers. We consider a binary treatment, T ($= 1$ for women who use grandparental childcare on a regular basis, $= 0$ otherwise), and a binary outcome, Y ($= 1$ for working mothers, $= 0$ otherwise). Each mother has two potential outcomes: Y_1, her working status would she have used grandparental childcare (treated) and Y_0, her working status would she have not used it (control). If treated and control mothers would only differ with respect to observed variables, a simple regression model could be used to estimate the effect of interest:

$$Y = \alpha + \delta T + \sum_k \beta_k X_k + \varepsilon,$$

(1)

where $Y = Y_1 T + Y_0 (1 - T)$ is the observed outcome, α, δ, and β represent parameters to be estimated (δ being the one of interest) and ε represents the error term. However, as discussed in the previous section, unobserved preferences for grandparental childcare and labour force participation might be correlated. In this case, the error term in equation (1) would be correlated with T, implying the OLS estimator to be biased. We address this problem by instrumenting grandparental childcare.

The instruments we use are whether the mother's parents and her partner's parents are still alive or not. Consequently, we have four instruments. For illustration purposes, let us first consider only one grandparent per woman i.e., only one instrumental variable, Z ($= 1$ if the grandparent is alive, $= 0$ otherwise). An instrumental variable (IV) has to

affect the probability of using grandparental childcare (relevance) without having a direct influence on the mother working status (validity or exclusion restriction). The exclusion restriction means that any effect of the instrument on the outcome must operate via its effect on the treatment: $Y_{tz} = Y_t, \forall\ t, z \in \{0,1\}$ (Angrist et al., 1996).

An IV can be thought of as a randomization device: the instrument, possibly conditional on control variables X, assigns units to either the treatment or control groups independently of the outcome. Formally,

$$(Y_1, Y_0, T_1, T_0) \perp Z \mid X, \tag{2}$$

where $T_1,\ T_0$ are the potential treatment statuses depending on the instrument's level assignment. In our case, receiving the treatment results from a joint decision of parents and grandparents. Being alive is a necessary but not sufficient condition for grandparents to provide childcare. Grandparents in poor health might have been willing to provide childcare to their grandchildren if only they were able to do so. In what follows, we will first assume that when grandparents are alive they are in sufficiently good health and willing to provide childcare and discuss the bias due to unobserved mothers preferences for childcare.

To better understand what different estimators estimate, it is useful to employ Imbens and Angrist's (1994) classification of units accordingly to the way they may react to the assignment to the different values of the instrument (Imbens and Angrist, 1994). Panel A of Table 2 shows that a first group, termed *compliers*, consists of units that conform to the instrument assignment ($T_1 = 1$ and $T_0 = 0$). Other units are not influenced

by the instrument assignment and are defined either as *always-takers* ($T_1 = T_0 = 1$) if they always take the treatment irrespectively of the assignment, or *never-takers* ($T_1 = T_0 = 0$) if they never take the treatment. Finally, *defiers* do the opposite of their assignment status ($T_1 = 0$ and $T_0 = 1$).

In our case, compliers are mothers who use grandparental childcare when the grandparent is alive and, of course, do not use it when the grandparent is dead. Always-takers and defiers clearly do not exist (T_0 is necessarily equal to 0) and the general classification simplifies into the one described in Panel B of Table 2[5].

< Table 2 about here >

We can think of the endogeneity problem in equation (1) as deriving from the fact that mothers' childcare preferences may break the randomization assignment process related to the presence/absence of grandparents. This would be the case of mothers who have preferences such that they would never use grandparental childcare (never takers). OLS is biased because the treated group (composed only by compliers) is compared with a control group which is a mixture of compliers and never takers– see table 2 panel B. Never-takers correspond to the women who have preferences towards each of the extremes of the externalness scale, that is a preference for the most internal type of childcare (group A in figure 1) and a preference for the most external type of childcare (group B in figure 1). These two types of never takers give rise to biases in opposite

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[5] This situation is similar to the Zelen's (1979) single-consent design where patients are randomly assigned to two groups: the first group of patients is only offered with the standard therapy, while patients in the second group can choose between the standard and new therapy.

directions, so it is not possible to say a-priori whether the coefficient estimated by OLS is down or upward biased.

So far it has been assumed that when the grandparent is alive he/she is willing to provide childcare. However, in our application the treatment intake depends also on the grandparent's preferences for providing childcare. Less traditional grandparents might prefer to enjoy their free time in social activities rather than provide childcare, for example. In other words, the treatment intake results from a joint decision: mothers must be willing to use grandparental childcare and the grandparent must be willing to provide it. As a consequence, never takers include those mothers who would refuse grandparental childcare if available (grandparent alive and willing to help) and those who would accept help from the grandparent who, however, is not willing to help. The preferences toward childcare of this latter group are more similar to those of the compliers than to those of the other never takers. If we assume for a moment that mothers are always willing to use grandparental childcare if available, then never takers would only be composed by those with grandparents not willing to provide childcare. If this were the case, mothers who are compliers or never takers would not differ according to their childcare preferences but to that of their parents. Even in this case, there might be an endogeneity issue as less traditional grandparents are also more likely to have less traditional daughters who might be more likely to be participating in the labour market. In these circumstances, OLS would be biased downward because never takers will be more likely to have strong preferences toward work.

Let us now consider what an IV analysis estimates in our case. Under the exclusion restriction and relevance assumptions, Angrist et al. (1996) show that the IV estimand

can be seen as the causal effect on the sub-population of compliers (local average treatment effect, LATE):

$$\frac{E[Y_i \mid Z_i = 1] - E[Y_i \mid Z_i = 0]}{E[T_i \mid Z_i = 1] - E[T_i \mid Z_i = 0]} = E[Y_{1i} - Y_{0i} \mid T_{1i} - T_{0i} = 1] = LATE. \qquad (3)$$

Angrist et al.'s (1996) result is also based on the monotonicity assumption, which amounts to assume the non-existence of defiers. As noticed before, in our context this assumption is satisfied by the nature of our instrumental variables[6]. Similarly, in our context always-takers do not exist. Consequently, all treated are compliers and the LATE coincides with the average causal effect on the treated (ATT) (Angrist, 2004):

$$LATE = E[Y_{1i} - Y_{0i} \mid T_{1i} - T_{0i} = 1)] = E[Y_{1i} - Y_{0i} \mid T_i = 1)] = ATT$$

An alternative approach to regression model (1) would be to use *Z,* instead of *T,* as main independent variable of interest. This approach, known as intention-to-treat (ITT) is justified under assumption (2) and gives unbiased estimates of the effect of the assignment rather than that of the treatment. Interestingly, the IV estimand will coincide with the ITT estimand divided by the "lease up rate" (the proportion of complying mothers; see Angrist and Pischke, 2009, p. 164):

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[6] Angrist et al. (1996)'s result also requires that the instrument is as good as randomised (i.e., the conditional independence assumption (2) holds without conditioning on covariates), SUTVA (meaning that potential outcomes for each unit are not influenced by the level of instrument and treatment assigned to other units).

$$\frac{ITT}{\pi(compliers)} = \frac{E\big[Y_i \mid Z = 1)\big] - E\big[Y_i \mid Z = 0)\big]}{P\big[T_{1i} - T_{0i} = 1\big]}$$

Therefore, we can expect the effect estimated by IV to be higher in magnitude than the one obtained by an ITT-type analysis. The latter underestimates the effect of grandparental childcare because only mothers with grandparents alive can use it and not all mothers with grandparents alive actually use grandparental childcare.

If covariates need to be accommodated to make the assumptions more plausible, as in our case, we can think of Angrist et al. (1996) results as applying within cells defined by covariates values (Frölich, 2007). Our situation is more complex also because we have four and not just one binary IV. In the presence of covariates and with many IVs, the IV estimand can be seen as a weighted average of causal effects for instrument-specific compliers (Angrist and Pischke, 2009) but the main insights from the previous discussion still apply. We use a standard two-stage least squares (2SLS) estimator despite the fact that both the endogenous and the dependent variables are binary. This choice is justified by the fact that the interpretation of results is more straightforward (Hellevik, 2009; Powers and Xie, 2008), and tests on the IVs can be easily implemented[7]. The availability of more than one instrument for the endogenous variable T allows us to implement an over-identification restriction test in addition to the F-test of relevance. The tests will be presented in Section 6 together with the results.

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[7] The use of standard 2SLS methods with dichotomous dependent variables is very common in empirical works. See for example, Conley and McCabe (2012). We also used a bivariate probit model with the same exclusion restrictions as used in the analyses reported in the paper. Results are very similar to those presented here.

5. Existing studies on the effect of grandparental childcare on mothers' labour supply

There is limited evidence on the relationship between the use of grandparental childcare and mothers' labour supply. Due to data constraints, some papers use proxy measures for grandparental childcare. In her paper on the effect of (formal and informal) childcare availability on work and fertility decisions in Italy, Del Boca (2002) goes round the endogeneity problem by using as a key variable 'having at least one grandparent alive' - which is assumed to be correlated with the use of grandparental childcare but not to affect directly women's work and fertility decisions. Hers is an ITT analysis which, for the reasons discussed above, is expected to underestimate the effect of grandparental childcare. Nonetheless, Del Boca finds a positive effect of having at least one grandparent alive on the probability that women work.

Ogawa and Ermisch (1996) find a positive relationship between intergenerational co-residence and the labour supply of young women and interpret this result as reflecting the childcare role played by the woman's parents or parents-in-law. Ogawa and Ermisch's analysis is somehow intermediate between an ITT analysis using indicators for alive grandparents and our analysis using actual help received by grandparents. Differently from Ogawa and Ermisch (1996), Abendroth et al. (2012) using data from the second round of the European Social Survey (ESS) find no significant effect of having at least one of the grandparents living in the household on the number of working hours of employed mothers.

García-Morán and Kuehn (2012) find that having grandparents close increases the probability of mothers to work. However, the German Socio-Economic Panel (GSOEP)

employed by the authors does not provide information on grandparental childcare but only on childcare provided in general by relatives. These authors adopt a simulation approach using a general equilibrium model of residence choice, fertility decisions, and female labor force participation that accounts for the interrelationships among these processes. They simulate alternative counterfactual scenarios and find that without grandparent-provided childcare there would be fewer women participating in the labor market.

Compton and Pollak (2011), show that close geographical proximity to mothers or mothers-in-law has a substantial positive effect on the labor force participation of women with young children. They argue that the mechanism through which proximity increases labor supply is the availability of childcare. The authors argue that proximity is a good instrumental variable for childcare arrangements as the positive effect of proximity on labor force participation does not extend to groups for which grandparent-provided child care is not a determinant for their labor supply like men, unmarried women without children, or those with sick mothers or sick mothers-in-law.

The distance between mothers and grandparents residence strongly influences the probability to receive childcare (see e.g., García-Morán and Kuehn, 2012). However, proximity of mothers and their parents is related to family values (Hank, 2007) which, in turn, might be associated to unobserved preferences about female labour force participation. The falsification tests implemented by Compton and Pollak (2011) seem to show that there is no clear evidence that family values are associated with labour force participation preferences. However, when forming a stable union, mothers may choose their geographical location anticipating the need or desire of using grandparental

childcare. Along these lines, Leopold et al (2012) find that young adults who had an own child tend to stay closer to their parental home. The falsification tests implemented by Compton and Pollak (2011) cannot rule out this issue. Thus, we claim that the geographical distance might not be a credible instrument. Nonetheless, in section 6.3 we will use information on geographical distance between the mother and grandparents in an alternative definition of our Instrumental Variables.

Data on grandparental childcare from 10 European countries is used by Dimova and Wolff (2011) who deal with the endogeneity of grandparental childcare in two ways. First, exploiting data available on several daughters of the same grandmother they use a fixed-effects analysis to control for unobserved household-level characteristics. As mothers' specific unobserved confounders might still have an impact, the authors also jointly estimate three equations for mothers' working decision and the probabilities to receive time and money transfers from grandmothers - allowing the error terms in the three models to be correlated. The authors exclude some variables related to grandparents' characteristics from the mothers' labour supply equation using them implicitly as instrumental variables. For example, they exclude grandparents' age and health status that might well be factors influencing the daughter's decision to work or not.

The effect estimated by the Dimova and Wolff (2011) is an average effect from people residing in the 10 countries included in the study. As noticed by Aassve et al (2012), this approach might be problematic insofar as the estimated average impact might represent poorly the country-specific effects - with important consequences for the interpretation of the results in terms of policy implications. Similarly to Dimova and Wolff (2011), Aassve et al (2012) use a bivariate probit model for mothers' labour force

participation and grandparental childcare using information on whether the respondent's mother is alive and the number of siblings the respondent has as instrumental variables. The first instrument they use is similar to ours, but they limit their focus to the respondent's mother because the GGS does not provide information on the parents of the respondent's partner. Their second instrument could be problematic if the size of the respondent's family is correlated to unobserved preferences for childcare and work.

The main result in Dimova and Wolff (2011) is that downward time transfers have a strong and positive effect on mother's labour force participation. A similar result is found by the same authors (Dimova and Wolff, 2008) on the particular population of immigrants in France and by Aassve et al (2012) but only for some of the GGS countries.

6. Results

6.1. OLS, ITT and 2SLS estimates of the effect of grandparental childcare on mothers' labour force participation

We start by presenting the OLS and ITT results so that later we can compare them with the results of the IV approach. Table 3 presents the results of the estimation of a simple linear probability model (OLS) where mother's participation in the labour market is regressed on grandparental childcare and on the control variables described in section 2. Since our IV approach uses as instruments having or not grandparents alive, we cannot include information on the grandparents. Characteristics of grandparents such as the health status and geographical proximity are only used in some of the robustness checks presented in the next section. Although the characteristics of grandparents would be

essential to study the determinants of grandparental childcare (see e.g., Hank and Buber, 2009), this is beyond the scope of the present paper.

We find a highly significant positive association between the use of grandparental childcare and the probability to work. Mothers who use grandparental childcare are 20 percentage points more likely to work. The effects of other characteristics of the mother are as expected: the number of children and lower education decreases the probability of working while father's education turns out to be not significant.

< Table 3 about here >

Table 4 shows the results of a linear probability model where the covariates of interest are the variables that will be used as instruments in the IV approach. From this type of ITT analysis we can see that having grandparents alive has a positive effect on the probability of mothers to work.

< Table 4 about here >

The results of the 2SLS estimation[8] in Table 5 show that mothers who use grandparental childcare are 32 percentage points more likely to work, an effect comparable to that of having tertiary versus primary education. To better appreciate the magnitude of the estimated effect, we calculated the predicted probability of working of a typical woman (aged 35, with secondary education, with one child aged 0-2) who uses

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[8] We used the ivreg2 command in STATA (Baum et al, 2007).

grandparental childcare and that of a similar woman who does not use grandparental childcare. These are 81.6 and 49.4, respectively.

< Table 5 about here >

The estimated effect of grandparental childcare is significant and higher than the one estimated by OLS. As argued in section 4, this OLS downward bias might be due to the prevailing effect of mothers with a preference for the most external type of childcare with respect to the effect of mothers with a preference for the most internal type of childcare and/or to the effect of grandparents' unobserved preferences.

As expected, the effect estimated by 2SLS is also stronger than the one obtained with the ITT analysis (Table 4). Our estimates suggest that the effect of grandparental childcare obtained using proxy variables for provision of grandparental childcare, as in Del Boca (2002), might be underestimated. Similarly, García-Morán and Kuehn (2012) find that the effect of proximity on labour force participation is smaller than the effect of actual childcare provided by relatives.

6.2. IV assumptions: tests and robustness checks

As discussed in section 4, the IV approach is based on some fundamental assumptions of which monotonicity, IVs relevance and validity are the most important. As already noticed, monotonicity is satisfied by the nature of the instrument.

Descriptive evidence in favour of the IVs relevance, i.e. non-zero association between the instrumental variables and the endogenous variable, is provided in Table 1

which shows that the proportion of grandparents alive is considerably higher among mothers receiving help. The relevance of the instruments is confirmed by the results in Table 6. The four instrumental variables, in particular the ones regarding grandmothers, are significantly associated with grandparental childcare after having controlled for the effect of covariates.

< Table 6 about here >

The fact that the instruments are not weak is also confirmed by the Cragg-Donald Wald F-test[9] presented in Table 5. The F-statistic of the test of correlation among the instruments and the endogenous variable is 21.506 overcoming the threshold of 10 usually considered acceptable (Staiger and Stock, 1997).

We turn now to the discussion of the exclusion restriction. This assumption would be violated if the instrumental variables influence the outcome through channels other than childcare provision. The death of a grandparent might produce an income shock, for example. If a mother relies on grandparental financial support to be out of the labour market, their death might push her to find a job. On the other hand, working mothers that receive an inheritance after grandparents' death might decide to quit working. Also the health status of grandparents might be associated with mothers' probability to work. For example having grandparents alive but in poor health might have a negative impact on the probability of mothers to work if they have to take care of the elderly. Having more IVs than endogenous variables allows us to test the exclusion restriction assumption by implementing a test of over-identifying restrictions. The joint null hypothesis that the

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[9] This variant of the standard Cragg-Donal F-test is required because we are allowing heteroskedasticity of any kind and so errors to be not i.i.d. (Baum et al., 2007).

instruments are valid and that the excluded instruments are correctly excluded from the estimated equation is not rejected (Hansen J-statistic = 2.244; p-value = 0.523). We also implemented a simple falsification test. We estimated the effect of having grandparents alive on the working decisions of mothers without children. We selected a sample of 2,919 women in a couple but without children, in the same age-range as mothers in our main sample (between 23 and 51 years old). We find that none of the four IVs was significantly associated with Y (results available from the authors upon request). This provides evidence that having or not grandparents alive does not have an effect per se on the probability of mothers to work but only through its effect on the provision of grandparental childcare.

Table 7 shows the results of different robustness checks. Our IV approach would not be valid if having grandparents alive has a direct effect on mothers' labor market outcomes. That could be the case if grandparents who are alive but in bad health need to be taken care of. So, in a first robustness check we exclude all families where at least one grandparent is chronically sick, assisted or helped by the mother.

In a second robustness check we change the definition of the instrumental variables. Each instrumental variable is now equal to 1 if the correspondent grandparent is alive *and* geographically close (i.e. if the distance is at most 16 km). Finally, we selected only grandparents in good health conditions *and* used the new instrumental variables. The estimated effect of grandparenting remains similar to the ones obtained in the analyses shown before[10].

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[10] We tried additional specifications of the IVs obtaining similar results. In particular, we considered the number of grandparents alive and we restricted the analyses only to grandmothers. Results are available from the authors upon request.

< Table 7 about here >

6.3. Heterogeneity of the grandparental childcare effect

Finally, we address the possibility that grandparental childcare has a different effect for different subgroups of mothers. Exploiting the large sample size, we divide it, in turn, according to the level of education of the mother, the number and age of the children in the household, and geographical area of residence. Table 8 shows the results both using the OLS and the IV approach. Again, IV estimates are larger than the OLS ones with the exception of mothers with tertiary education for whom the effect is not significant. However, for this group the sample size is rather small. For all the other sub-groups the IV estimate is significant. The effect of grandparental childcare is stronger for those mothers who need childcare the most: mothers with lower education (that can signal lower income, and so lower availability of resources for alternative types of childcare) and mothers with younger children.

< Table 8 about here >

The pattern of differences between OLS and 2SLS across the educational groups can be due to less heterogeneity within the group of more educated women in what regards "externalness" preference. In the extreme case in which all more educated women share the same preferences, the bias due to not observing them would not exist. The same does not seem to happen for lower educated women. The OLS results for this group are downward biased suggesting that there are important differences among lower

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educated women in what concerns "externalness" of childcare preferences. A similar reasoning applies with respect to the age of children as most children older than 3 go to formal childcare and so there is less heterogeneity within this group.

The large positive difference between the regional effects obtained in the instrumental variable and OLS estimations might be interpreted as indicating that the share of mothers with preference for a more external type of childcare is larger in the North and Centre than in the South. Even though studying the effect of measures such as increasing the availability of public childcare on women's work decisions is beyond the scope of the paper, these results do suggest that such a measure might be more effective in the North and Centre of Italy than in the South.

We conclude by assessing if the availability of grandparental childcare has a different impact for mothers working full or part time. In the last two lines of Table 8, we report the estimated effect of grandparental childcare care on two samples that exclude, respectively, mothers working part-time and mothers working full-time. Independently on the number of work hours, grandparental childcare has a strong and similar effect on the probability of working. The patterns of bias suggest that unobserved preferences differ more according to labour market participation than to labour market attachment. Grandparental childcare impacts the probability to work rather than the number of hours worked.

7. Summary and concluding remarks

This paper studies the role of informal childcare provided by grandparents on the reconciliation of motherhood and labour force participation of women. The association

between help with childcare provided by grandparents and mother's work decisions is not necessarily causal. Unobserved preferences for a more external or internal type of childcare might be associated with the propensity of mothers to work. As a consequence, the results from a simple regression might be biased. In the framework of the potential outcome approach, this problem can be seen as arising from the non-compliance of mothers to the availability of grandparents. These never-taker mothers are likely to have unobserved preferences different from those of the compliers. Some of them might refuse grandparental childcare because of a strong preference for an external (formal) type of childcare, others because of a preference for the most internal type of childcare (they want to look after the children themselves). The presence of these two groups produces biases in opposite directions and it is not clear a-priori if a naive OLS analysis would be upward or downward biased. Also grandparents' unobserved preferences for providing childcare might be correlated with mothers' propensity to participate in the labour market.

Using an Instrumental Variable approach on Italian data (the Multiscopo 2003), our results show that having grandparents helping with childcare increases mother's labour force participation. The effect is stronger for lower educated mothers, with young children and living in the North and Centre.

We argue that the effect of grandparental childcare found in previous studies might be underestimated. Due to data limitations, some studies used proxy variables for grandparental childcare, such as having grandparents alive (Del Boca, 2002) and co-residence with grandparents (Ogawa and Ermisch, 1996). These approaches are similar to Intention-to-Treat analyses where the effect of the assignment and not that of the

treatment is estimated. Since is not always the case that once the conditions for grandparental childcare provision are met (grandparents willing and able to provide help), this type of childcare is actually used, these studies are likely to underestimate the effect of informal care provided by grandparents.

Our results seem to support the idea that grandparents are more used as a substitute of formal childcare than as a substitute of parental childcare. The fact that all OLS analyses underestimate the effect of grandparental childcare can be interpreted as a prevailing effect of women with a preference for the most external type of childcare. This suggests that a policy directed towards increasing availability of formal childcare would be effective in increasing female labour force participation, especially considering that grandparents may be increasingly less available for taking care of their grandchildren. Insofar as grandparents who are still active in the labour market might be less available to help in looking after their grandchildren, the evidence presented here suggests a need to frame retirement policies in the larger picture of family and gender policies (Cook, 2006; Brussig and Knuth, 2007). This is particularly relevant because despite claiming that the provision of high-quality childcare is a priority, the European Commission also acknowledges that most member states have not been able to ensure the desired access to formal childcare (European Commission, 2009). In other words, an increase in retirement age would not be detrimental for female labour force participation only if it is accompanied by a sufficient increase in the availability of childcare. This conclusion is reinforced by the fact that the effect is stronger for low educated women who, earning relatively lower wages, may find it more difficult to pay for the services offered by the private market.

However, more childcare services alone may not be enough to attain the goal of increasing female labour force participation if not accompanied by an increase in its perceived quality. Similarly to what happens when people use many other services, parents face information asymmetry when using childcare services (either privately or publicly provided). This might make mothers not willing to trust their children to institutions even if they have a latent preference for an external type of childcare. Some studies hint at the importance of trust in the quality of childcare in child care choices (Hank and Kreyenfeld, 2003; Borck and Wrohlich, 2008; Shlay, 2010) and El-Attar (2007) finds that lower trust decreases the probability of leaving the child with a more external type of child care. If parents do not trust the quality of formal childcare, an effect of grandparental childcare in mothers' work decisions may be observed even if there were free and universal access to formal childcare.

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Figure 1: The relationship between mothers' externalness preference for childcare and demand of grandparental childcare

Demand of grandparental childcare

+

-

group A

group B

τ

Externalness of childcare preference
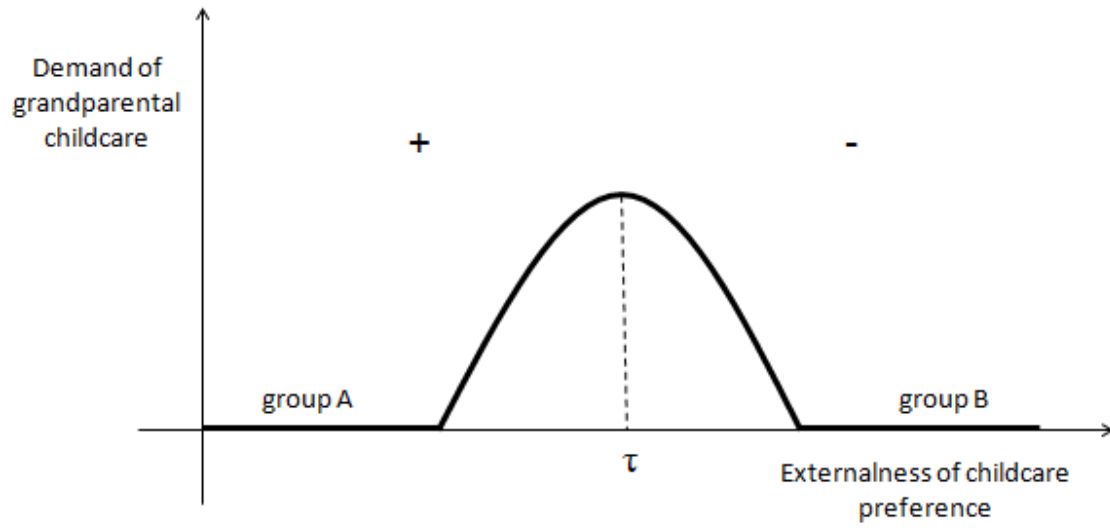
Table 1: Descriptive statistics

Variables	All mothers		Grandparental childcare: YES		Grandparental childcare: NO	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Dependent variable						
Mother is working	0.52		0.66		0.42	
Independent variables						
Mother's age	37.20	6.10	36.0	5.50	37.90	6.40
Mother's education: tertiary	0.11		0.13		0.10	
Mother's education: secondary	0.45		0.51		0.41	
Father's education: tertiary	0.11		0.11		0.11	
Father's education: secondary	0.39		0.43		0.37	
At least 1 child aged 0-2	0.29		0.34		0.25	
Number of children younger than 14	1.50	0.63	1.55	0.63	1.46	0.63
Endogenous variable						
Grandparental childcare	0.40		---		---	
Instruments						
Maternal grandmother alive	0.88		0.94		0.83	
Maternal grandfather alive	0.70		0.75		0.66	
Paternal grandmother alive	0.83		0.89		0.78	
Paternal grandfather alive	0.61		0.69		0.56	
Observations	3,852		1,523		2,329	

Table 2 – Classification of mothers by instrument assignment and treatment intake

Grandparent alive (Z)	Panel A Grandparental childcare (T)			Panel B Grandparental childcare (T)	
	Yes	No		Yes	No
Dead	defiers always takers	compliers never takers			compliers never takers
Alive	compliers always takers	never takers defiers		compliers	never takers

Table 3: OLS estimates of the effect of Grandparental childcare on Mother's Work

Dependent Variable: Mother is working	Coef.	Robust s.e.	Sig.
Mother's age	0.045	0.011	***
Mother's age squared	-0.001	0.000	***
Mother's education: tertiary	0.409	0.027	***
Mother's education: secondary	0.221	0.017	***
Father's education: tertiary	0.022	0.028	
Father's education: secondary	0.008	0.017	
At least 1 child aged 0-2	0.007	0.018	
Number of children younger than 14	-0.061	0.011	***
Grandparental childcare	0.198	0.015	***
Constant	-0.481	0.200	**
Observations		3,852	

Notes: robust standard errors; *, ** and *** significant at 10%, 5%, and 1% level, respectively. Dummy variables for regions are included but coefficients are not reported.

Table 4: OLS estimates of the effect of Grandparents being Alive on Mother's Work

Dependent Variable: Mother is working	Coef.	Robust s.e.	Sig.
Mother's age	0.053	0.011	***
Mother's age squared	-0.001	0.000	***
Mother's education: tertiary	0.432	0.027	***
Mother's education: secondary	0.237	0.018	***
Father's education: tertiary	0.013	0.029	
Father's education: secondary	0.006	0.018	
At least 1 child aged 0-2	0.009	0.018	
Number of children younger than 14	-0.056	0.012	***
Maternal grandmother alive	0.037	0.024	
Maternal grandfather alive	-0.008	0.017	
Paternal grandmother alive	0.043	0.021	**
Paternal grandfather alive	0.027	0.016	*
Constant	-0.615	0.204	
Observations		3,852	

Notes: robust standard errors; *, ** and *** significant at 10%, 5%, and 1% level, respectively. Dummy variables for regions included but coefficients not reported.

Table 5: 2SLS estimates of the effect of Grandparental childcare on Mother's Work

Dependent Variable: Mother is working	Coef.	Robust s.e.	Sig.
Mother's age	0.040	0.012	***
Mother's age squared	0.000	0.000	**
Mother's education: tertiary	0.392	0.031	***
Mother's education: secondary	0.208	0.020	***
Father's education: tertiary	0.026	0.028	
Father's education: secondary	0.006	0.017	
At least 1 child aged 0-2	0.005	0.018	
Number of children younger than 14	-0.065	0.012	***
Grandparental childcare	0.323	0.106	***
Constant	-0.448	0.203	**
Tests on the Instrumental Variables			
Cragg-Donald Wald F statistic	21.506		
Hansen J statistic	2.244		
(Chi-sq(3) P-value)	(0.523)		
Observations		3,852	

Notes: Instrumental variables 2SLS linear regression (robust standard errors: *, ** and *** significant at 10%, 5%, and 1% level, respectively). Instrumented variable: grandparental childcare. Instrumental Variables: maternal grandmother alive, maternal grandfather alive, paternal grandmother alive, paternal grandfather alive. Dummy variables for regions included but coefficients not reported.

Table 6: OLS estimates of the effect of Grandparents' being Alive on Grandparental childcare

Dependent Variable: Grandparental childcare	Coef.	Robust s.e.	Sig.
Mother's age	0.040	0.011	***
Mother's age squared	-0.001	0.000	***
Mother's education: tertiary	0.124	0.030	***
Mother's education: secondary	0.090	0.018	***
Father's education: tertiary	-0.040	0.030	
Father's education: secondary	0.004	0.018	
At least 1 child aged 0-2	0.014	0.020	
Number of children younger than 14	0.030	0.013	**
Maternal grandmother alive	0.154	0.021	***
Maternal grandfather alive	0.022	0.018	
Paternal grandmother alive	0.084	0.020	***
Paternal grandfather alive	0.057	0.017	***
Constant	-0.513	0.216	**
Observations		3,852	

Notes: robust standard errors; *, ** and *** significant at 10%, 5%, and 1% level, respectively. Dummy variables for regions included but coefficients not reported.

Table 7: Robustness Checks

Mother's characteristics	OLS			2SLS			Obs.
	Coef.	Robust s.e.	Sig.	Coef	Robust s.e.	Sig.	
Analysis 1							
Only families with all grandparents in good health and without need of assistance	0.184	0.018	***	0.238	0.115	**	2,851
Analysis 2							
Instrumental variable equal to 1 if the grandparent is alive and geographically close	0.198	0.015	***	0.304	0.052	***	3,852
Analysis 3							
Criteria in both Analysis 1 and Analysis 2	0.184	0.018	***	0.309	0.058	***	2,851

Notes: *, ** and *** significant at 10%, 5%, and 1% level, respectively. Outcome: mother's working status; Instrumented variable: grandparental childcare; Instrumental Variables: maternal grandmother alive, maternal grandfather alive, paternal grandmother alive, paternal grandfather alive. All other control variables, as shown in Table 5, are included but coefficients are not reported.

Table 8: Heterogeneous Effects of Grandparental childcare on Mother's Work. OLS versus 2SLS estimates

Mother's characteristics	OLS			2SLS			Obs.
	Coef.	Robust s.e.	Sig.	Coef	Robust s.e.	Sig.	
Education							
Primary	0.194	0.024	***	0.370	0.141	***	1,700
Secondary	0.231	0.022	***	0.284	0.166	*	1,724
Tertiary	0.087	0.037	**	0.047	0.267		428
Age of children							
At least one child aged 0-2	0.209	0.027	***	0.563	0.177	***	1,103
All children older than 2	0.191	0.018	***	0.192	0.124		2,749
Number of children							
One child	0.214	0.020	***	0.261	0.160		2,189
More than one child	0.178	0.023	***	0.277	0.141	*	1,663
Residence							
North Italy	0.202	0.024	***	0.484	0.159	***	1,507
Centre Italy	0.212	0.037	***	0.551	0.235	**	605
South Italy	0.180	0.023	***	0.205	0.174		1,740
Working time arrangement							
Full-time	0.196	0.017	***	0.327	0.111	***	3,214
Part-time	0.168	0.018	***	0.328	0.136	**	2,497

Notes: *, ** and *** significant at 10%, 5%, and 1% level, respectively. Outcome: mother's working status; Instrumented variable: grandparental childcare; Instrumental Variables: maternal grandmother alive, maternal grandfather alive, paternal grandmother alive, paternal grandfather alive. All other control variables, as shown in Table 5, are included but coefficients are not reported.