

Unintended Consequences of Pension Reforms on Inter-Generational Fertility*

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Abstract

This paper investigates the role of childcare provided by grandparents for fertility and labor supply decisions of their offspring. We exploit a decade of pension reforms in Italy that, by raising the retirement age, have mandated grandparents to longer working horizons than they would have had otherwise. We argue that the rise in retirement age has meant a negative shock to the supply of informal child care provided to the next generation. We document substantial negative effects on the age at first child for married couples whose parents were the most affected by the reforms, and we show that the postponement in fertility decisions roughly matches the shift observed for retirement age. Despite the large effects on fertility, the effect on the labor supply of women is more uncertain.

Keywords: Fertility; Informal Child Care; Pension Reforms.

JEL Classification: J13, J61, H42.

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1 Introduction

The demographic transition has caused profound revisions of social security systems in several developed countries. In most cases the reforms have meant a shift from a defined benefit to a defined contribution system, and a gradual increase of the retirement age with the aim of increasing the attachment to the labor market at the end of the life-cycle (see Milligan and Wise 2012).

By changing the minimum retirement age, the eligibility rules, and also the return on mandatory saving to retirement, pension reforms are likely to affect consumption, saving and labor supply of the individuals directly affected.¹ In addition, to the extent that generations are altruistically linked, the effect of the reforms spills from the generations directly affected over generations that are not directly affected at both ends of the life-cycle. The care provided by members of one generation to their fathers' or sons' generation is a potentially important channel through which the effects of pension reforms transmit from one generation to the other.

In this paper we focus on the effect of pension reforms on the transfers of time from the older to the younger generation. Among the many ways in which resources can be transferred between generations, the time devoted by grandparents to the care of grandchildren plays a prominent role. Cardia and Ng (2003) report that in the US Health and Retirement Survey (HRS) grandparents devote an average of 8 hours per week to the care of their grandchildren. García-Morán and Kuehn (2012) use the Wave 2 of Survey of Ageing and Retirement in Europe (SHARE) to show that between 23 to 70 percent of grandparents take care of their grandchildren on a daily or a weekly basis. While the incidence of care provided by grandparents varies significantly between Northern, Central and Southern European countries, the time transfers across generations are quantitatively important in all countries compared to other in-kind or money transfers (see Albertini et al. 2007).²

We argue that pension reforms, by raising the minimum retirement age of grandparents, may induce a negative shock to the supply of informal care offered to the next generation.

¹For recent work on the effect of pension rules on consumption see Battistin et al. (2009), on saving see Attanasio and Brugiavini (2003) and on wealth see Bottazzi et al. (2006); on portfolio choice see Bottazzi et al. (2011); on labor supply see Liebman et al. (2009).

²In Germany the role of grandparents as providers of care to children is at the heart of the current political debate on family policies. The Federal Minister of Families, Kristina Schröder, has made a law proposal to grant grandparents the right to unpaid leave (up to 3 years) in order to take care of their grandchildren. See <http://www.bmfsfj.de/BMFSFJ/Presse/pressemitteilungen,did=190234.html>

Grandparents' time that would have been potentially available for child care provision is sensibly reduced because of the longer working horizon caused by pension reforms. We therefore investigate the inter-generational effects that pension reforms may have on the fertility and labor supply decisions of the next generation. This is not the first paper to relate pension reforms to fertility and labor supply, but it makes a departure in studying the inter-generational effects of such reforms. While the literature on the intra-generational effect of reforms on labor supply is quite extensive, to the best of our knowledge only one paper, Billari and Galasso (2008), looks at the effect on intra-generational fertility.³

Other than being an unique case of study for a series of pension reforms that were implemented starting from the mid Nineties, Italy has its own peculiarities that motivate the relevance of our research question. Despite its sharp increase in the recent years, values of the *total fertility rate* are still well below the so called replacement threshold, which is equal to about 2.1 children on average per woman. Italy is among the European countries with the lowest fertility, ranked as it is - according to official figures - 20th out of 27 countries. The patterns in the top panel of Figure 1 show that the increase in the fertility rate observed in the last decade is driven by Northern and Central regions of the country, which have now closed the gap with the most conservative regions in the South. The contribution of immigrant couples to this pattern is certainly an important explanation; on the other hand, it is well documented in demography that the pattern could result from a temporary shock resulting from the postponement of fertility decisions for the generation of women born in the Sixties. The bottom panel of Figure 1 shows that the *mean age at birth* has continued to rise, and has reached 31.2 years in 2009, with a difference of almost a year and a half compared to the mid Nineties. The geographical divide in this dimension is worth of notice.

According to figures from the National Statistical Office, 75.1 percent of the population under the age of 70 has the mother still alive. The father is alive for 61.4 percent of this population. Some 40 percent of individuals aged between 25 and 34 still live with their parents, thus depicting a culture in which *family ties* are important. The high rate of cohabitation between parents and children has been subject of several studies. Becker et al. (2010) relate it to the lower job insecurity of parents compared to children. Manacorda and Moretti (2006), by exploiting our same pension reforms as a source of exogenous variation to household in-

³Billari and Galasso (2008) exploit the pension reforms as source of exogenous variation to test two alternative theories: children as "consumption" vs. "investment" good.

come, argue that it is due to the parents' taste for cohabitation. Giuliano (2007) relate the high rate of co-residence in Southern European countries to the sexual revolution of the 1970s that liberalized parental attitudes towards pre-marital sex, and emphasizes the role of cultural attitudes in determining living arrangements. Alesina and Giuliano (2010) construct a measure of cultural family ties using the World Value Survey, and show a North-South divide between European countries, with family ties being generally stronger in Southern European countries.

But cohabitation is not the only sign of strong family ties in Italy. Billari and Tabellini (2010) report data on the share of young adults (age 15-24) who declare to be financially dependent on their parents, and show that Italy ranks among the highest share countries (74 percent), together with Greece (71 percent) and Spain (67 percent). In addition, family ties are likely to show up in housing tenure decisions. Even for those who have moved out, the family of origin is still a point of reference often reinforced by residential proximity. According to official figures, the mother of 5.5 percent of married individuals lives in the same block; above 22 percent of mothers live in the same town, 11.9 percent within a mile; 76 percent of individuals meet regularly one of their parents on a weekly basis.

These patterns are likely to be related to how wealth is transmitted between generations in Italy. Guiso and Jappelli (2002) investigate the role of inter-generational transfers for the saving time required to purchase a house and find a small impact on saving time. However, they show that transfers make households to purchase considerably larger homes. Cannari and D'Alessio (2008) show that received transfers account for between 30 and 55 percent of the net wealth held by households. More recently, Jappelli et al. (2013) show that the fraction of households receiving real estate transfers rises from 30 percent in 1993 to just above 35 percent in 2006. These numbers are large but in line with the evidence available for other countries. Villanueva (2005) shows that bequests account for 31 percent of total net worth for the US and 10 percent for Germany and provide estimates of the elasticities of lifetime gifts to lifetime income in the UK, the US and West Germany arguing that features of each country's public programs, including social security system, shape the relation between transfers and parents' incomes.

Tomassini et al. (2003) use National Statistical Office survey data to show the importance of parents' financial help for the children housing tenure decisions and document that all of the couples who received help from both spouses' parents received money with which to purchase

a house.

In the context pictured, grandparenting also plays an important role. There are about 11 million grandparents in the country, which corresponds to about one third of the population aged above 35. This percentage is higher for Central and Southern regions, where it picks at above 40 percent. Grandparents hang around regularly with grandchildren: 42.4 percent of them daily, and 38.5 percent at least once a week. Most importantly for the purpose of this paper, official figures from the National Statistical Office report that 85.6 percent of grandparents actively contribute to child care (grandmothers being the most involved). The time granted by grandparents is mostly related to occasional commitments of parents (24.5 percent), and to their working hours (24.4 percent). Babysitting (11.8 percent), sickness of grandchildren (9.3 percent) and holydays (8.9 percent) are additional occasions of child care provision.

Taken at face value, the above figures suggest that the role played by informal institutions in Italy marks a significant departure from other European countries. The importance of family ties for the country as a whole hides considerable variation between regions, which we will exploit in our exercise. We will be documenting a North-South divide in the strength of family ties, with most Northern regions resembling to continental Europe countries, and Southern regions where the role of extended families is much more pronounced. Moreover, as made clear by Figure 2, the higher percentage of grandparents in Southern regions involved in the care of grandchildren is mirrored by the kindergarten coverage in the country.

Overlaid is the problem of the effects of child raising costs on fertility and employment decisions of mothers, which is the subject of an extensive literature. Blau and Robins (1989) use a sample of labor-market and life-histories and show that higher child-care costs reduce the birth rate for non-employed women, increase the probability of leaving employment, and reduce that of entering the labor-force. Del Boca (2002) uses panel data and finds that the availability of child care and part-time work contracts increase both the probability of working and having a child. Boca and Vuri (2007) focus on how the child-care institutions in Italy affect labor market decisions of mothers, and Dimova and Wolff (2011) focus on Europe as a whole and find a strong positive effect of grandchild care on the labor force participation and the degree of labor market involvement of the young mother. More recently García-Morán and Kuehn (2012) provide a quantitative model to investigate the effects of grandparent-provided

care on fertility and labor supply decisions.⁴

A common issue in this literature is the endogeneity of child-care utilization with respect to both fertility and labor market participation decisions. If the tastes for kids are correlated between generations and if daughters of non-working mothers are more likely to give birth, a positive association between the time that grandmothers devote to their grandchildren and fertility would not mean a causal relation. Furthermore, fertility often means a period of leave from work for mothers (and possibly also fathers), which can translate on foregone earnings and also lost opportunities for gains in human capital. These losses are likely to be higher for more skilled individuals, for whom the cost of directly caring for kids is typically higher. But if ability traits are at least in part inherited, there will be factors affecting both the supply of grandparenting time and the cost of caring, which will make it hard to attach a causal interpretation to the correlation between fertility and availability of informal care from grandparents.

Finally, grandparents provided child-care is typically un-paid, and therefore using this type of care relaxes the budget constraint by increasing the amount of time parents (typically mothers) can devote to work, and by reducing the demand for paid care.⁵ But the demand of care is itself related to income: higher income grants access to possibly better quality care, and the opportunity cost of caring children increases with income possibilities. Relatedly, to the extent that better able parents earn more and also allocate their time more efficiently between markets and non-markets activities within the households, higher earnings will be associated to lower demand of care.

This paper makes use of a number of policy interventions that took place in Italy during the 1990s and modified substantially the eligibility conditions for retirement. The reforms have meant that the retirement age has increased for relatively younger generation of workers and has remained unchanged for older generations. We document unintended consequences of these interventions on inter-generational fertility decisions, building on the quasi-experimental setting to add internal validity to our conclusions. We make use of the newly released wave of the *Family and Social Subjects* data (October 2012), which is part of an integrated system of

⁴Bick (2011) provides a life-cycle model incorporating both paid and un-paid care to children. The model is calibrated, simulated and used to show that the lack of subsidized child care is an obstacle to female labor market participation and depresses fertility.

⁵Of course, parents can use the unpaid help from grandparents to consume more leisure, with no effect on the households labor supply.

social surveys carried out by the Italian National Statistical Office on daily lives of individuals and families.

Our main findings can be summarised as follows. First, we show that pension reforms that were implemented in Italy during the Nineties have affected markedly the working horizon of individuals. We document negative effects on retirement probabilities of about 5 percent at age 50, which up to 1992 was the minimum retirement age set by law. In light of the steep transition rates from work to retirement in the 50 to 55 age range observed before 1992, we conclude that the reforms lengthened by about 5 years the working horizon of individuals. We document that this is more so for females, and for individuals from low socio-economic background. Manacorda and Moretti (2006) document similar effects on labour market participation rates using data from the Bank of Italy.

Second, we show that females in households with grandparents affected by the reforms have different fertility decisions than those where grandparents are unaffected. In particular, we show that the fraction of mothers by age 30 in the former group is 4 percentage points lower than in the latter group, 30 being roughly the average age at birth in the population as documented in the bottom panel of Figure 1. This result is robust to various specifications and alternative data selection criteria that we perform. In particular, our findings are more pronounced if we consider only grandparents living in the proximity of the household. More in general, we find that pension reforms have generated an inter-generational postponement in fertility decisions such that the effects on age at first child roughly match the effects on the working horizon of grandparents. As pointed out by Manacorda and Moretti (2006), the postponement can partly be explained by positive effects of the reforms on the children's propensity to live at home with their parents. However, the effects in this paper are way larger than those found by Manacorda and Moretti (2006) using the same reforms. Thus we argue that our conclusions reveal causality mechanisms at work on top of those previously documented in the literature.

Third, we find a limited effect on labor supply of the women, whether we consider the part-time or full-time job contracts. This adds to the extensive literature on the effects of child care policies on labor supply of the women, in which considerable uncertainty still remains on the magnitude of the elasticity of maternal employment with respect to the price of child care (for a survey see Blau 2003). In line with our findings, recent work on Sweden - a high fertility rate country - has shown a limited effect of childcare policies on labor supply of the women

(see Lundin et al. 2008). Recent evidence for lower fertility countries, including Italy, seems also compatible with our results. Nicodemo and Waldmann (2009) focus on Mediterranean countries and show that in those countries a very high percentage of women who do not work use non-parental child care arrangements.

Fourth, our results show that proximity of grandparents matters for fertility. However, if grandparents help out their children to buy “close” homes, the effect of proximity of grandparents on fertility is just masking that on housing tenure. To rule out this possibility, we model the probability of grandparents giving financial help to their children to buy home. The evidence shows no difference between the affected and the unaffected cohort, which we interpret as evidence that proximity of grandparents matters for its effect on childcare.

The remainder of the paper is organized as follows. While Section 2 relates our paper to the available literature, the issues of endogeneity are discussed more in the depth in Section 3. Section 4 describes pension arrangements in Italy, and the various pension reforms that we use to set out the quasi-experimental setting employed in the analysis. Section 5 presents that data. Section 6 the results. Conclusions and policy implications are deferred to Section 7.

2 Fertility decisions and child care

As a part of the demographic transition at large, the fertility rate has declined in several high-income countries over the last decades. In the US the fertility rate went from above 3.65 children per women in 1960 to 2.1 in 2010. In the UK from 2.69 in 1960 to 1.94 in 2010. In France from 2.85 in 1960 to 2 in 2010. In Germany from 2.37 in 1960 to 1.39 in 2010. Italy is no exception to this general trend, and the reduction in fertility has been more pronounced going from 2.41 in 1960 to 1.4 in 2010.⁶

These trends have prompted a large literature investigating the causes behind the decline. The classic demographic transition theory attributes the decline to changes in social life, which come with industrialization and urbanization. While this approach has been perceived as adequate to explain millennial trends, its performance to account for changes on a decade scale is heavily discussed (see for a survey Mason 1997). More modern versions of the classic transition theories emphasize the sociological and psychological aspects of the fertility decisions,

⁶The fertility rate is defined as: “the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates.” see <http://data.worldbank.org/>.

as in Lesthaghe (1980) and Caldwell (1992), the former emphasizing a shift of values towards self-fulfillment, the latter the emotional nucleation of the family. In seminal work, Becker et al. (1960) argues that sociological and psychological approaches allow a partial understanding of fertility transitions and proposes to analyze fertility decisions within an economic framework. One advantage of the economic framework is to allow a quantitative evaluation of the fertility decisions. The framework attributes a role to tastes, income and prices, and identifies the sources of benefits and costs. On the benefits side, children are treated as a “consumption durable goods” and thus are assumed to provide utility.⁷ The cost of children factors in expenditures for food, clothing, health care and education, but also the opportunity cost of time parents devote to child care and direct childcare costs. In addition, the framework allows to incorporate institutional factors, which affect tastes, beliefs and resources to be allocated to childbearing. The early work by Becker paves the way for later developments, where a special attention is devoted to the role of childcare costs.

The reduction in childcare costs can affect both fertility and labor supply decisions. The idea is formalized in Ermisch (1989a) and Ermisch (1989b), and related works explore the effect of various child care modes. Lehrer and Kawasaki (1985) focus on two-earners households and on the effect of three main child care arrangements, provided by relatives, babysitters, and organized facilities, on “intended fertility”. They find that intended fertility is higher for households who rely on relatives rather than organized facilities or babysitters. Blau and Robins (1989) measure child care costs with the average per-child weekly expenditure on child care by geographic site and find that those costs affect the birth rate for non-employed but not for employed women. Mason and Kuhlthau (1992) study the perceived impact of child care costs on women’s labor supply and fertility, and show that the lack of child care is perceived as a constraint for the labor supply rather than for the fertility decisions. Richter et al. (1994) focus on Urban Thailand households and find that the type of care for the first child also has impact on the likelihood of a second birth. Their results show a primary role for informal child care arrangements and in particular for grandmothers.

Kravdal (1996) focuses on how the local supply of day-care services affect fertility in Norway, and does not find strong support for the idea that the availability of child care increases fertility. The opposite findings appear in Oláh (2003) who focuses on Hungary and Sweeden and shows

⁷Children can equally be production goods, a possibility that is also acknowledged.

that the intensity to have a second child increases as the availability of public childcare improves. The results are consistent with Del Boca (2002), who works with Italian data and looks at the effects of the availability of child care (and part-time job opportunities) on fertility and labor supply decisions. The focus is on publicly funded child care provided by organized facilities and the results show a positive effect of the availability of child care on fertility.⁸

Most early papers look at the effect of child care provided by organized facilities, with limited emphasis on the alternative care providers, outside or inside the households. A recent exception is Hank and Kreyenfeld (2003), who use the German Socio-Economic Panel to strike the balance between formal and informal child care arrangements. They find a positive effect of informal care arrangements on the probability of entering parenthood, and no evidence of the effect of the public day care provision on fertility.⁹

A common difficulty in the literature has to do with the likely endogeneity of price (and income) changes, which makes it hard to identify the elasticities of the demand for children with respect to prices and income. A strand of new papers try to circumvent the endogeneity issues exploiting exogenous variation induced by reforms typically targeted to reduce the cost of child care. Schlosser (2006) exploits the introduction of free pre-school to study Arab mothers fertility and labor supply within a differences-in-differences framework. A quasi-experimental framework is also used in Mörk et al. (2009), who exploit the exogenous variation of childcare charges across Swedish municipalities and find a negative association between child care costs and the number of first and higher order births.

This paper also deals with endogeneity by setting out a quasi-experimental setting, but marks something of a departure from other work in the literature because we consider reforms that act directly on potential “providers” of informal child care (the grandparents) rather than on the cost of child care. To the best of our knowledge, this is the first paper that makes use of this channel as an exogenous shock to study fertility and labor supply decisions across generations.

⁸The availability of child care is measured as the ration between the number of child care slots available (for children under 3 years of age) to the number of children 3 years of age or less.

⁹A related literature looks at the effect of family benefits and tax incentives on fertility. Gauthier and Hatzius (1997) provide a survey of this literature and study whether higher governmental support for families has a positive effect on fertility by encouraging parents to have more children. The find signs of a limited effect, of the order of 0.07 children per woman in the long-run for benefits 25 per cent higher than average. See also Cohen et al. (2007), Kearney (2004), Laroque and Salanié (2003) and Milligan (2005).

3 Methods

3.1 Identification

In our setting there are *three* generations of individuals involved. *Grandparents* are the pivotal group that we use to define the populations of interest, and are those who are directly affected by the pension reforms. The offspring of such pivotal group will be referred to as *parents*, and are those who - in this setting - determine the demand of child care provision. The third generation involved is the offspring of the parental generation, that we will refer to as *children*. The fertility and labor supply decisions of parents will be investigated by considering the pension regime status of grandparents.

To fix ideas, assume that only *two* regimes are defined corresponding to pre-reform and post-reform requirements for pension eligibility.¹⁰ Let D be an indicator for grandparents facing post-reform requirements. As a first approximation this dummy corresponds to a deterministic function of the year of birth of grandparents. It follows that the comparison of contiguous cohorts of grandparents reveals the effects of introducing more stringent rules for pension eligibility. The internal validity of such design rests upon a regression discontinuity idea, in which the two contiguous cohorts facing the sharp change in retirement rules would have been otherwise identical in the counterfactual scenario of no reforms. The availability of multiple cohorts of grandparents either side of the discontinuity point can be used to robustify the quasi-experimental setting.

Let (Y_0, Y_1) be the two potential outcomes defined by the pension regime. Outcomes can refer to *any* of the three generations considered, but are always indexed by the regime faced by grandparents. For example, they could denote the retirement status of grandparents, had they experienced the $D = 0$ or the $D = 1$ regime; they could also denote the fertility decisions of their offspring, had grandparents experienced the $D = 0$ or the $D = 1$ regime.

We will consider the following reduced form parameters:

$$E[Y_1 - Y_0 | D = 1, C = \bar{c}],$$

where C indexes cohorts of parents depending of their year of birth, and \bar{c} is the first cohort exposed to post-reform requirements. Under standard smoothness conditions for the profile of

¹⁰As pension eligibility criteria depend on the minimum retirement age, and this is set by law, we may similarly define *multiple* regimes corresponding to the criterion in place. Since the generalization is logically simple but complicates notation, we will consider only the *binary* case in what follows.

Y_0 with respect to the year of birth of grandparents, the above parameter measures the reduced form effects of the reforms on the outcome of interest.

3.2 Estimation

We produce two set of estimates. A first set of estimates shows the effect of the reforms on the grandparents' labor supply. These estimates serve the purpose of demonstrating that the reforms have actually increased the grandparents' working lives, which has potentially detrimental effects on the time grandparents can devote to caring the children generation. We define M as the minimum retirement age, which varies between grandparents according the their gender, their year of birth, and their occupation (public, private and self-employed). Defining \tilde{Z} as a dummy being equal to one for someone older than M , we run the following regression:

$$y_i^{gp} = \alpha_0 + \alpha_1 \tilde{Z}_i + \varepsilon_i^{gp} \quad (1)$$

where y_i^{gp} is equal to one if grandparent i is employed and equal to zero otherwise, and ε_i^{gp} reflect the effect of unobservable factors on the labor supply behavior of grandparents.

The second set of estimates relates fertility (and labor supply) decisions to whether grandparents are available for the care of the children generation. The estimates are obtained using as regressors the number of grandparents who are older than the minimum retirement age and running the following regression:

$$y_j^p = \gamma_0 + \gamma_1 Z_j + \varepsilon_j^p \quad (2)$$

where y_j^p is equal to one if parent j gave birth (is employed, respectively) and zero otherwise, $Z_j = \sum_{i=1}^4 \tilde{Z}_i$, and ε_j^p reflect the effect of unobservable factors on the fertility and labor supply behavior of parents.

4 Pension arrangements in Italy

The demographic transition has brought about a series of reforms to the social security system in Italy during the nineties. Before that, replacement rates were high, pension benefits were computed on the basis of the earnings-model and generous early retirement schemes were available. These characteristics of the Italian social security system meant a very high ratio of pension benefits to GNP, which reached almost 16% in 1992, the highest value among industrialized countries. To respond to these growing unbalances, three main reforms were passed

between 1992 and 1997. The first of these reforms was presented in the second half of 1992 by the Government led by Giuliano Amato, and it is known as the “Amato” reform. The other two reforms were passed in 1995 and 1997, when Lamberto Dini and Romano Prodi, respectively, were in charge. These reforms are known as the “Dini” and the “Prodi” reform. While the three reforms differ on some aspects, they have important common traits, which relate to the increase in the retirement age and in minimum years of contributions for pension eligibility, to the abolition of seniority pensions for all those who started working after 1995, to a gradual reduction in pension benefits, and to the indexation of pension benefits to prices rather than to wages. A notable feature of the three reform, that we will exploit for identification, is to leave relatively unaffected the generous pre-1992 regime for relatively old workers, defined as those who in 1995 had at least 18 years of contributions (15 years of contributions in 1992) and which we call “old”, for brevity. Therefore, in our data we will distinguish two main pension regimes, a pre-reform and a post-reform regime. Table 1 shows the retirement ages across the two regimes, for the “old”, for those with less than 18 years of contribution in 1995 (the “middle-aged”) and for those who entered labor market in 1995 (the “young”). Two main retirement schemes are available in Italy: old age and seniority pensions.¹¹ For both schemes, Table 1 indicates that the eligibility rules are generally more restrictive in the post-reform regime. In the new regime the young are entitled to a flexible retirement age (from 57 to 65), subject to incentives. For those already working in 1995 (the old and the middle-aged), the reform raises minimum retirement age for old age pensions of private sector employees (65 for men and 60 for women), but not for public employees and self-employed. For the old and middle-aged, the reform raises minimum years of contributions for both seniority pensions and old age pensions; for the young, whose pension award formula is entirely contribution based, the minimum years of contributions is just 5 years.

The between cohorts variation in pension arrangements provides the exogenous variation in the time grandparents can devote to the care of their grandchildren. To track the variation, we use a unique source of data, providing information on the grandparents’, parents’, and children generations, which we describe next.

¹¹In 2012, the Government led by Mario Monti abolished the seniority pensions and introduced for early pension scheme, which is accessible by male (female) workers who contributed for at least 42 (41) years.

5 Data

We use data from the newly released wave of the *Multiscopo* Survey, conducted by the Italian National Statistical Office in 2009. In particular, we use the *Famiglia Soggetti Sociali - Condizione Infanzia* section of the survey. This is the third wave of a large cross sectional survey conducted every 6 years which collects detailed retrospective information on employment occasions and fertility decisions for each member of the sampled household. The sampling frame is designed to yield figures that are representative of the Italian population.

We construct *two* complementary working samples, one for each set of estimates provided below, and use year of birth as the main selection variable. The effect of pension reforms on grandparents' labor supply is analyzed with the *Sample of Grandparents*, which is obtained selecting in individuals born between 1908 and 1966. The *Sample of Grandparents* counts 9,137 males and 10,070 females, the average age and education are well balanced between genders, with females being slightly older than males, and males being slightly more educated, as reported in Table 2.

The second set of estimates is produced using the *Sample of Parents*, which is obtained selecting in those couples whose female member is born between 1950 and 1980, which gives an age range that corresponds to grandparents being born between 1908 and 1966. As shown in Table 2, the size of the *Sample of Parents* is 4,664 ,females are on average about 4 years younger than males, and slightly more educated.

To bolster our confidence in the chosen sample selection, we use the *Sample of Parents* to investigate how the number of grandparents above the minimum retirement age, Z , varies with the female year of birth. Figure 7 plots the residual from the regression of Z on education and age of grandparents against year of birth of the females member in the *Sample of Parents* couples. The figure shows two lines, one for females aged 27 and 30. For both the age groups, the figure records a sharp drop corresponding to 1995, when the *Dini's Reform* was implemented, which endorses our identification strategy and indicate that the *Sample of Parents* is able to detect a discontinuity in the labor supply behavior of grandparents.

5.1 Measuring family ties

To measure the strength of family ties, we rely on the principal component analysis and focus in the *Sample of Parents* on the following variables: dummies for having at least one, two

or three grandparents living in the same municipality, dummies for seeing at least one, two or three grandparents more than once a week, dummies for contacting by phone at least one, two or three grandparents more than once a week, dummies for having lived with at least one, two or three grandparents in the same municipality when married, dummy for having received help in buying the house and a dummy for regularly having lunch or dinner with parents and relatives on Sunday.

Our measure thus differ from Alesina and Giuliano (2013), who also rely on a principal component analysis but use subjective information in the World Value Survey obtained from 3 questions eliciting respondents' opinions on the importance of family, on the duties towards parents, and on the duties of parents. While being conceptually different, both family ties measures appears to be consistent with the sociological literature.

Alesina and Giuliano (2013) find for Italy that the lowest level of family ties are in the northern region of Valle D'Aosta, the highest in the Southern region of Calabria. Figure 3 plots the geographical distribution of our family ties measure and delivers a picture consistent with the evidence provided in Alesina and Giuliano (2013), with family ties being stronger in Southern than in Northern regions. Our evidence thus confirms the role played by familism, and the sharp divide that exists between Northern and Southern regions in Italy, which has been discussed at large in the literature starting from the work by Banfield (1958).

Family ties appear to be negatively correlated with female and elderly labor force participation, as shown in Figure 7, consistently with what is found in Alesina and Giuliano (2013).

While indicating interesting route of investigation, the two-way correlations between family ties, labor supply and fertility hide the role of relevant confounders, which is explored in the remaining of the paper.

6 Results

6.1 Labor supply of grandparents

Our identification strategy requires first to quantify the effect of the pension reforms on labor market participation of grandparents. The first stage is needed to establish the validity of pension reforms as source of exogenous shock to the potential number of hours devoted by grandparents on child care provision.

To this end, we focus on the *Sample of Grandparents* and estimate a modified version of

equation (1), where we dummify the variable \tilde{Z} to account for the fact that pension eligibility rules vary with age depending on the year of birth, which leads to define a set of 9 dummy variables, noted as \tilde{Z}^{age} , with $age = \{51, 52, \dots, 59\}$.¹² Notice that for individuals aged less than 50 and more than 59, \tilde{Z} is deterministically equal to 1 and 0, respectively. Additionally, we enlarge the set of regressors to include regional dummies, education and year of birth of the individual.

Results from this regression are presented in Table 3. The evidence indicates that the probability of being employed is higher for those who are not eligible between the age of 51 and 57. This age range corresponds to the cohorts of those whose retirement ages were increased by the 90's pension reforms. The results thus suggest that changes in pension eligibility rules is indeed affecting the labor supply behavior at end of the working life. These results are consistent with the evidence supplied by Brugiavini and Peracchi (2003), who document a sizable effect of the pension reforms on employment rates.

The other columns in Table 3 distinguish between high school dropouts and high-school graduates, again focusing separately on males and females. Notice that since high school graduates enter the labor market later than high school dropouts, the variable Z^{age} is defined starting from the age of 53. The results, which are also reported diagrammatically in Figure 7, show that the effect on pension eligibility rules is stronger for high school dropouts. The results thus imply that retirement decisions of the most educated individuals are not affected by changes in the eligibility rules. This result is valid for both males and females. Moreover, if we move towards the lower end of the ability distribution, we can see that the gender differences documented in the columns (1) and (2) of Table 3 are mainly driven by gender differences amongst high school graduates. If there is limited social mobility across generations, as it is the case for Italy, these results suggest that the largest negative effects on the potential number of hours available from grandparents are for households from low socio-economic backgrounds. This result is important for what follows, as this group may be the most constrained in terms of access to formal child care services.

Next, we turn to analyze the effect of changes in the pension eligibility rules on the fertility and employment decisions of parents, which is done using the *Sample of Parents*.

¹²We also explored the alternative possibility of estimating equation (1) separately for each age group. The results are similar but less precise.

6.2 Fertility and labor supply decisions of parents

Using the *Sample of Parents* we estimate equation (2), where y^p , is, in turn, a dummy for being mother and a dummy for being employed.

Equation (2) is modified to add to the baseline specification, a set of controls, including regional dummies, education of man and woman, grandparents' education and age, number of living grandparents, number of siblings, female employment rate and dummies for male and female being first born child. Moreover, we dummify Z to account for between ages differences in the effect of the number of available grandparents on fertility and labor supply.

The results are reported in Table 4. Columns (1) and (2) refer to the baseline and the extended specifications for the fertility equation. The results are similar between the two columns, but the effect detected in the extended specification are unsurprisingly smaller. In both the baseline and the extended specification, the effect is found to positive and increasing with age. The results indicate that the probability of being mother increases as the number of available grandparents increases. The probability is between 2 to 6 percent higher, depending on the specification and on the age of the mother, if one extra grandparent is available. The results are both statistically and economically significant. The percentage of mothers in the age range 32 – 34 is on average 77%, and therefore a 5 – 6 percent increase means a sizable change in fertility behavior induced by changes in pension eligibility rules of grandparents.

Columns (3) and (4) of Table 4 focus on female employment decisions and provide, respectively, the results for the baseline and the extended specification. The results do not deliver a clear pattern. The effect is positive and statistically significant in column (3) for women aged between 20 and 22, and is negative in column (4) for women aged between 29 and 34. These results are not incompatible with Nicodemo and Waldmann (2009), who find that in Italy, as well as in other Mediterranean countries, a very high percentage of non-working women use non-parental child care arrangements, including care provided by grandparents outside the households. Notice, however, that the fact that grandparents childcare does not seem to affect maternal labor supply does not imply that the lack of *formal* care to children is not an obstacle to labor supply. If parents have a strong taste for care provided by grandparents, they will be using the care provided by grandparents whatever their job market status.

While there is not clear evidence of changes in pension eligibility of grandparents affecting the employment decision of parents, the results on fertility are less ambiguous. However,

pension reforms, by increasing the retirement age of a generation, can also interfere with the living arrangements decision of the next, a point made by Manacorda and Moretti (2006). Therefore, we also estimate equation (2) using as outcome a dummy for living with parents. The results, reported in columns (5) and (6), of Table 4 show that the probability of living with parents decreases for females aged between 26 and 34 as the number of available grandparents increases.

This result requires further investigation due to the likely relation between fertility and living arrangements decisions and raises the issue of what are the factors driving our main results on fertility. We address this issue in the next section.

6.3 Family ties and fertility decisions of parents

If the fertility were just driven by the living arrangements decisions, one should observe the same patterns in fertility and living arrangements, no matter the strength of family ties. On the contrary, if grandparents have an important role as childcare providers, the effect of the labor supply of grandparents should be stronger the stronger family ties.

In Table 5 we split the sample between weak and strong family ties couples and estimate equation (2), where y^p , is, in turn, a dummy for being mother, a dummy for being employed and a dummy for living with parents.

The results presented in Table 5 are consistent with those from Table 4: an effect is found for fertility and living arrangements decision, while the evidence on employment is more uncertain. In addition, Table 5 shows that the effect on fertility and on living arrangements decisions is stronger among strong family ties couples. For women aged between 29 and 31, one additional grandparent eligible for retirement increases the probability of being mother by 3.5% and by 6.5% in the weak and strong family ties samples, respectively. For women in the same age range, the probability of living with parents decreases by 4.7% in the strong family ties, and by 2.4% in the weak family ties sample.

6.4 The role of Grandparents: Preferences versus Opportunities

Our results do not help to clarify whether the role of grandparents is mostly driven by parents' preferences or by the lack of alternative childcare opportunities. To shed light on the question, we add the kindergarten coverage to the set of controls and interact it with the pension eligi-

bility dummies. The results are presented in Table 6 and confirm a stronger effect for fertility and living arrangements decisions in the strong family ties sample. The coefficients on the interaction terms imply that the availability of kindergartens attenuates the effect of pension eligibility of grandparents in the weak family ties sample.

On the grounds that parents have a stronger preference for grandparents' childcare if family ties are stronger, the results indicate that the effect of grandparents' pension eligibility on fertility is likely to be driven more by preferences than by lack of alternative childcare opportunities.

6.5 Grandfathers versus Grandmothers

So far our approach treats grandfathers and grandmothers as fungible providers of childcare. As a matter of fact, this is not the case, which means that we should expect our results to be mostly driven by the pension eligibility of grandmothers.

To check for this possibility, we run two separate regressions, in one Z refer to grandfathers, in the other to grandmothers. The results are reported in Table 7 and show that the effects on fertility are mostly driven by grandmothers, even though the effect of pension eligibility of grandfathers is detectable among the strong family ties couples.

The results point to the prominent role of grandmothers, but raise an important concern. To the extent that grandmothers are housewives, changes in pension legislation should not affect their availability as providers of childcare. Therefore, we run our main regressions on fertility, employment, and living arrangements on the sub-sample of housewives grandmothers. The results are reported in Table 8 and show a small effect of pension eligibility on fertility. None of the coefficients on the Z 's is statistically significant, except for that on the Z for females aged between 29 and 31, at a 10 percent level.

7 Conclusions

Among the many ways in which generations are altruistically linked, the transfer of time for childcare plays an important role. Grandparents are widely recognized as primary providers of childcare across the social ladder and in various institutional settings. The effect of the availability of childcare on fertility decisions has been studied, but much less is known on the effect of grandparents' childcare on the fertility decisions of the offspring generation. A recurrent issue is the possible simultaneity between grandparents' labor supply decisions and

their offspring fertility decisions.

The demographic transition has raised life-expectancies and therefore has increased the time grandparents can spend with their grandchildren. However, the concurrent pension reforms, by raising the retirement age, have had a countervailing effect on the time grandparents can devote to the care of grandchildren. Interestingly, changes in pension legislation can provide the source of exogenous variation to study the effect of availability of grandparents' childcare on the fertility decisions of their offspring.

To assess the effect of grandparent's childcare on fertility, we focus on Italy. Italy is an interesting case to study for three reasons. First, Italy scores a low fertility rate in comparison with countries at the same stage of the economic development and records the postponement of fertility decisions of women born after the Sixties. Second, Italy underwent in the last decades a series of pension reforms, which provide the exogenous variation needed for the analysis. Third, Italy is a country where the family plays an important role, but where the strength of family ties considerably varies in society.

Exploiting data on the grandparents and parents generation, we find that the reduced availability of grandparents has a negative effect on fertility and this is much so in families where the family ties are stronger. The adverse effect on fertility can either be driven by preferences or by the lack of alternative childcare opportunities or by both. The shed light on the issue, we also explore the role of institutionalized childcare. To the extent that the effect is driven by parents' strong preferences towards grandparents' care, the availability of kindergarten should not attenuate the effect of availability of grandparents' care on fertility. Our results indicate that the availability of institutionalized childcare somewhat attenuate the effect on fertility, at a rate that is larger among the couple where family ties are weak. We interpret these results as evidence that the effect on fertility is mostly driven by preferences, but we cannot rule out a role for the availability of institutionalized childcare.

Overall, our evidence suggests that pension reforms have important side-effects on the transfers of time between the old and the young generations. While being unintended, the consequences of raising the retirement age of a generation affect the fertility decision of the offspring and have long lasting impact on the society as a whole.

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List of Tables

TABLE 1. Retirement age in Italy

		Old age pensions		
		<i>Minimum retirement age</i>		
		Private-sector	Public-sector	Self-employed
Pre-1992 regime	All workers	60(55)	65(60)	65(60)
Post-1997 regime	Old	Progressively rising to 65(60)	65(60)	65(60)
	Middle-aged	Progressively rising to 65(60)	65(60)	65(60)
	Young	Subject to incentives: 57-65		
		Seniority pensions		
		<i>Minimum years of contribution</i>		
		Private-sector	Public-sector	Self-employed
Pre-1992 regime	All workers	35	20	35
Post-1997 regime	Old	40 before age 57		40 before age 58
		35 after age 57		35 after age 58
	Middle-aged	40 before age 57		40 before age 58
		35 after age 57		35 after age 58
	Young	Abolished		

Notes. Old, middle-aged and young refer, respectively, to workers with more than 18 years of contributions in 1995, less than 18 years of contributions in 1995, and who start working after 1995. Female retirement age is reported in parenthesis when different from males. The minimum years of contribution for old age pensions was 15 years in the pre-1992 regime, and progressively rises to 20 in the post-1997 regime for old and middle-aged workers, and is 5 years for young workers.

TABLE 2. Sample statistics for both samples

	Sample of Parents		Sample of Grandparents	
	Male	Female	Male	Female
<i>Average age</i>	45.19	42.29	59.16	59.58
<i>% High School drop-outs</i>	0.45	0.39	0.57	0.58
<i>% High School graduates</i>	0.43	0.44	0.29	0.25
<i>% College graduates</i>	0.13	0.17	0.1	0.09
<i>% employed private sector</i>	0.42	0.27	0.46	0.29
<i>% employed public sector</i>	0.18	0.17	0.24	0.19
<i>% self-employed</i>	0.26	0.12	0.28	0.14
<i>% housewives</i>		0.2		0.37
<i>% living in Northern regions</i>	0.43	0.43	0.43	0.43
<i>% living in Central regions</i>	0.18	0.18	0.18	0.18
<i>% living in Southern regions</i>	0.39	0.39	0.39	0.39
<i>Sample size</i>	4664		9137	10070

TABLE 3. Effect of the reforms on labour force participation of grandparents - *Sample of Grandparents*

	Gender		Males		Females	
	Males	Females	HS drop.	HS grad.	HS drop.	HS grad.
Z_{51} (d)	-0.020** (0.009)	-0.010 (0.012)	-0.026** (0.013)		-0.014 (0.012)	
Z_{52} (d)	-0.033*** (0.010)	-0.021* (0.012)	-0.039*** (0.014)		-0.027** (0.013)	
Z_{53} (d)	-0.031*** (0.010)	-0.033** (0.013)	-0.068*** (0.019)	0.009 (0.018)	-0.039** (0.016)	-0.059 (0.051)
Z_{54} (d)	-0.043*** (0.010)	-0.027* (0.014)	-0.096*** (0.022)	-0.011 (0.020)	-0.040** (0.018)	-0.034 (0.056)
Z_{55} (d)	-0.035*** (0.011)	-0.037** (0.016)	-0.095*** (0.029)	-0.006 (0.011)	-0.045* (0.025)	-0.018 (0.028)
Z_{56} (d)	-0.025** (0.011)	-0.055*** (0.019)		-0.011 (0.011)		-0.046 (0.028)
Z_{57} (d)	-0.038*** (0.013)	-0.071*** (0.020)		-0.030** (0.012)		-0.048* (0.028)
Z_{58} (d)	-0.057 (0.051)	0.041 (0.070)		-0.022 (0.031)		0.023 (0.061)
Z_{59} (d)	-0.034 (0.044)	0.001 (0.079)		-0.014 (0.027)		-0.034 (0.074)
Observations	210542	233717	137400	73142	166646	67071

Note. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ - robust standard error in parentheses.

TABLE 4. Inter-generational effects of pension reforms.

	Fertility		Employment		Living with parents	
	<i>no-controls</i>	<i>controls</i>	<i>no-controls</i>	<i>controls</i>	<i>no-controls</i>	<i>controls</i>
Z^a						
<i>aged [20,22]</i>	0.014 (0.013)	-0.006 (0.016)	0.019** (0.009)	0.014 (0.011)	-0.011 (0.008)	0.007 (0.010)
<i>aged [23,25]</i>	0.026*** (0.009)	0.010 (0.011)	0.008 (0.008)	0.001 (0.009)	-0.012* (0.006)	0.002 (0.008)
<i>aged [26,28]</i>	0.031*** (0.008)	0.018* (0.010)	-0.006 (0.008)	-0.015 (0.010)	-0.027*** (0.007)	-0.015* (0.008)
<i>aged [29,31]</i>	0.062*** (0.010)	0.051*** (0.011)	-0.006 (0.010)	-0.019* (0.012)	-0.050*** (0.010)	-0.037*** (0.011)
<i>aged [32,34]</i>	0.061*** (0.012)	0.053*** (0.015)	-0.015 (0.012)	-0.032** (0.014)	-0.062*** (0.014)	-0.049*** (0.015)
Observations	39264	39264	39264	39264	39264	39264

TABLE 5. Inter-generational effects of pension reforms by family ties.

	Fertility		Employed		Living with parents	
	<i>weak f.t.</i>	<i>strong f.t.</i>	<i>weak f.t.</i>	<i>strong f.t.</i>	<i>weak f.t.</i>	<i>strong f.t.</i>
Z^a						
<i>aged [20,22]</i>	0.003 (0.024)	-0.004 (0.021)	0.018 (0.017)	0.011 (0.016)	0.000 (0.013)	0.010 (0.015)
<i>aged [23,25]</i>	0.011 (0.016)	0.018 (0.015)	0.015 (0.014)	-0.011 (0.013)	-0.002 (0.011)	0.003 (0.012)
<i>aged [26,28]</i>	0.006 (0.016)	0.032** (0.013)	0.008 (0.015)	-0.030** (0.013)	-0.007 (0.012)	-0.021* (0.012)
<i>aged [29,31]</i>	0.035** (0.017)	0.065*** (0.015)	0.004 (0.017)	-0.042** (0.017)	-0.024 (0.015)	-0.047*** (0.016)
<i>aged [32,34]</i>	0.031 (0.021)	0.069*** (0.021)	0.002 (0.020)	-0.067*** (0.021)	-0.035* (0.019)	-0.064** (0.027)
Observations	19404	19860	19404	19860	19404	19860

TABLE 6. Inter-generational effects of pension reforms with kindergarten coverage.

	Weak family ties			Strong family ties		
	<i>fertility</i>	<i>employed</i>	<i>living with parents</i>	<i>fertility</i>	<i>employed</i>	<i>living with parents</i>
Z^a						
<i>aged [20,22]</i>	0.007 (0.024)	0.018 (0.017)	-0.001 (0.013)	-0.001 (0.021)	0.010 (0.015)	0.011 (0.016)
<i>aged [23,25]</i>	0.014 (0.016)	0.016 (0.014)	-0.003 (0.011)	0.015 (0.015)	-0.011 (0.013)	0.005 (0.012)
<i>aged [26,28]</i>	0.010 (0.016)	0.008 (0.015)	-0.009 (0.012)	0.031** (0.013)	-0.029** (0.013)	-0.022* (0.012)
<i>aged [29,31]</i>	0.041** (0.018)	0.003 (0.017)	-0.027* (0.015)	0.065*** (0.015)	-0.041** (0.017)	-0.048*** (0.016)
<i>aged [32,34]</i>	0.039* (0.022)	0.001 (0.020)	-0.039** (0.019)	0.068*** (0.022)	-0.067*** (0.021)	-0.065** (0.027)
$Z^a \times$ Kindergarten coverage						
<i>aged [20,22]</i>	0.001 (0.008)	-0.010 (0.006)	-0.001 (0.005)	0.007 (0.008)	-0.006 (0.006)	0.006 (0.006)
<i>aged [23,25]</i>	-0.006 (0.006)	-0.005 (0.005)	0.002 (0.004)	-0.007 (0.006)	0.001 (0.005)	0.009** (0.005)
<i>aged [26,28]</i>	-0.009* (0.005)	0.001 (0.004)	0.001 (0.004)	-0.005 (0.005)	0.005 (0.004)	0.003 (0.004)
<i>aged [29,31]</i>	-0.011** (0.005)	0.002 (0.004)	0.006 (0.004)	0.000 (0.005)	-0.000 (0.004)	-0.003 (0.004)
<i>aged [32,34]</i>	-0.012** (0.005)	0.005 (0.004)	0.007* (0.004)	0.002 (0.005)	-0.003 (0.004)	-0.004 (0.005)
Kindergarten coverage	0.072* (0.040)	0.019 (0.040)	-0.111** (0.044)	0.029 (0.037)	0.011 (0.039)	-0.027 (0.041)
Observations	19404	19404	19404	19860	19860	19860

TABLE 7. Inter-generational effects of pension reforms by gender of grandparents.

	Weak family ties		Strong family ties	
	<i>grandfathers</i>	<i>grandmothers</i>	<i>grandfathers</i>	<i>grandmothers</i>
Z^a				
<i>aged [20,22]</i>	-0.011 (0.037)	0.007 (0.036)	0.012 (0.032)	-0.007 (0.034)
<i>aged [23,25]</i>	-0.001 (0.028)	0.016 (0.025)	0.023 (0.025)	0.020 (0.023)
<i>aged [26,28]</i>	-0.025 (0.028)	0.029 (0.022)	0.031 (0.023)	0.054*** (0.019)
<i>aged [29,31]</i>	-0.021 (0.031)	0.098*** (0.024)	0.076*** (0.027)	0.089*** (0.021)
<i>aged [32,34]</i>	-0.024 (0.036)	0.101*** (0.031)	0.063* (0.035)	0.106*** (0.031)
$Z^a \times$ Kindergarten coverage				
<i>aged [20,22]</i>	0.002 (0.012)	0.009 (0.012)	0.001 (0.013)	0.027* (0.014)
<i>aged [23,25]</i>	-0.006 (0.009)	-0.005 (0.010)	-0.019** (0.010)	-0.004 (0.010)
<i>aged [26,28]</i>	-0.005 (0.008)	-0.016* (0.008)	-0.018** (0.008)	0.000 (0.008)
<i>aged [29,31]</i>	-0.010 (0.008)	-0.018** (0.007)	-0.007 (0.008)	0.009 (0.007)
<i>aged [32,34]</i>	-0.019** (0.008)	-0.016** (0.007)	-0.007 (0.008)	0.013* (0.008)
Kindergarten coverage	0.055 (0.040)	0.072* (0.040)	0.030 (0.036)	0.020 (0.036)
Observations	19404	19404	19860	19860

TABLE 8. Inter-generational effects of pension reforms - Subsample of couple whose grandmothers are both housewives

	Subsample of grandmothers being housewives		
	<i>fertility</i>	<i>employed</i>	<i>living with parents</i>
Z^a			
<i>aged [20,22]</i>	-0.034 (0.026)	0.001 (0.018)	0.010 (0.016)
<i>aged [23,25]</i>	-0.022 (0.017)	-0.005 (0.015)	0.011 (0.012)
<i>aged [26,28]</i>	-0.010 (0.016)	-0.033** (0.015)	-0.009 (0.013)
<i>aged [29,31]</i>	0.033* (0.018)	-0.026 (0.018)	-0.026 (0.016)
<i>aged [32,34]</i>	0.029 (0.023)	-0.038* (0.022)	-0.044** (0.022)
$Z^a \times$ Kindergarten coverage			
<i>aged [20,22]</i>	0.010 (0.009)	-0.007 (0.007)	-0.007 (0.006)
<i>aged [23,25]</i>	-0.009 (0.007)	0.006 (0.006)	0.006 (0.005)
<i>aged [26,28]</i>	-0.010* (0.006)	0.010** (0.005)	0.000 (0.005)
<i>aged [29,31]</i>	-0.008 (0.005)	0.007 (0.005)	0.002 (0.005)
<i>aged [32,34]</i>	-0.008 (0.005)	0.006 (0.005)	-0.002 (0.005)
Kindergarten coverage	0.051 (0.044)	-0.054 (0.041)	-0.044 (0.042)
Observations	15939	15939	15939

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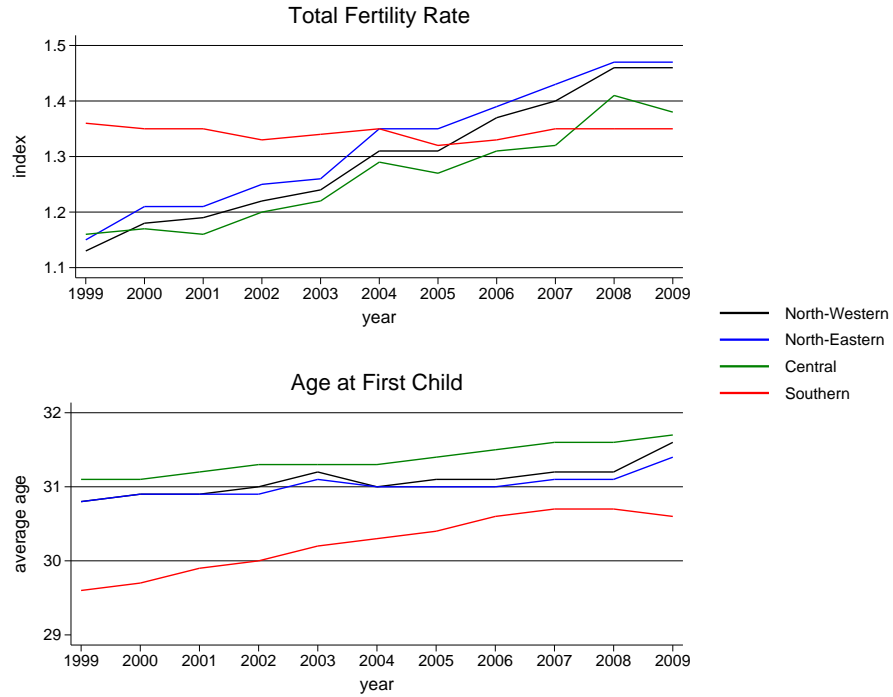
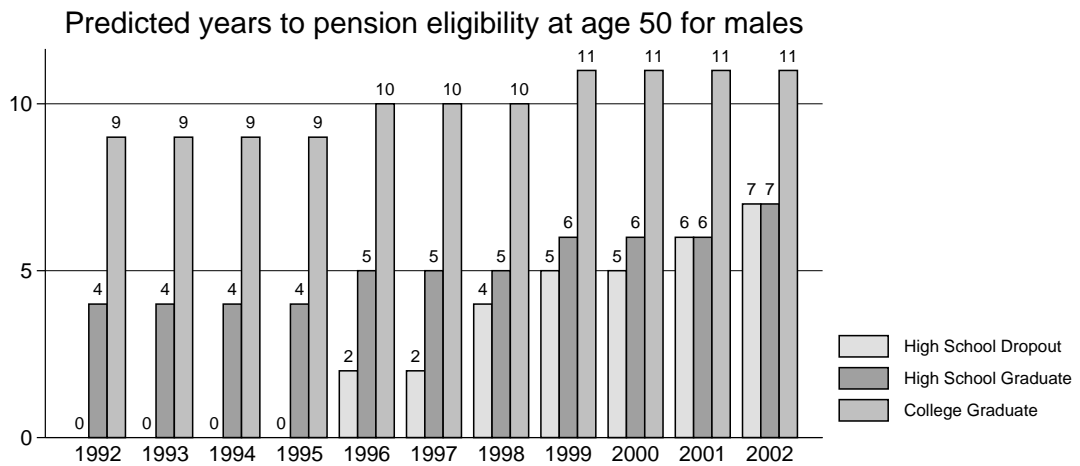


FIGURE 1. Evolution of the total fertility rate and age at first child by area of residence. *Source:* ISTAT.



Index of kindergarten coverage in 2009
 Percentage for 100 residents 0-2 year old

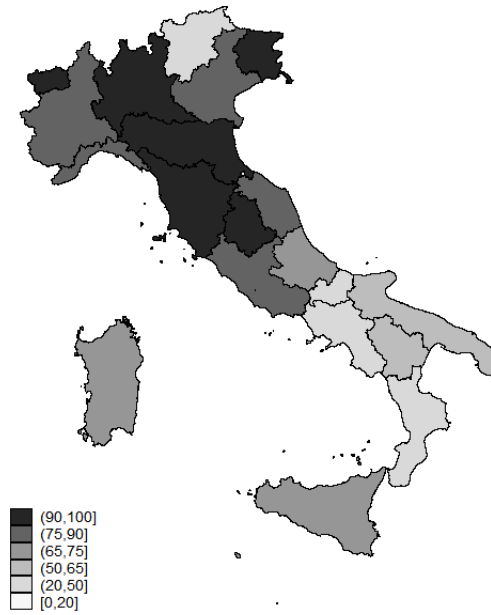
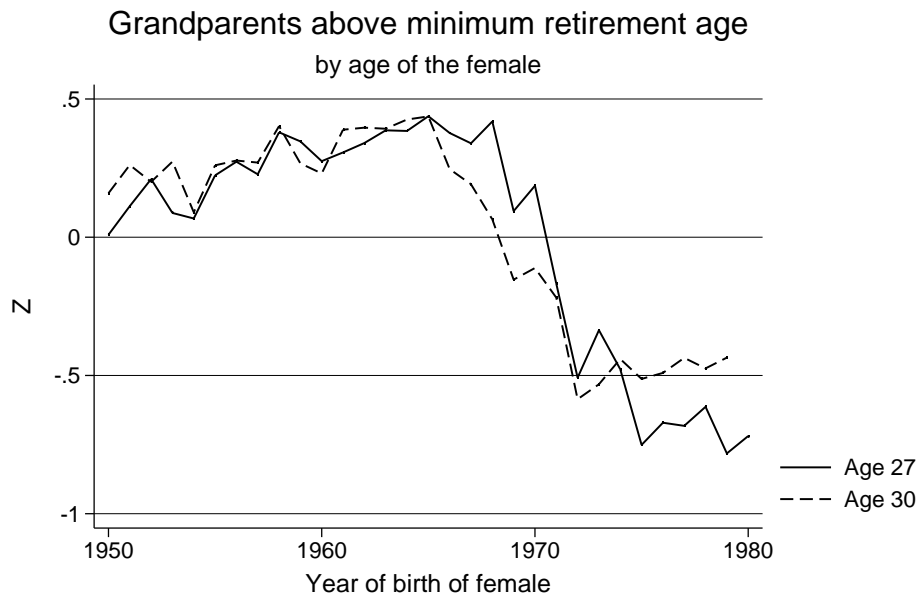


FIGURE 2. Distribution of the index of kindergarten coverage.



Note. Residuals of the regression of Z on education and age of grandparents to control for time-varying compositional differences.



FIGURE 3. Distribution of the family ties index across Italian regions.



