# Modeling the Italian female labour market participation with infertility shocks

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- PRELIMINARY VERSION -

**Abstract**

The negative association between fertility and female labour market participation is complicated by the endogeneity of fertility. We address this problem by using an exogenous variation in family size caused by infertility shocks, mainly related to the fact that nature prevents some women from achieving their desired fertility levels. Using the Bank of Italy's SHIW we find that children do not causally affect the Italian female involvement in the labour market. Results are confirmed exploiting the Istat Birth Survey, with insights of differentiated effects according to the age of the child.

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# 1 Introduction

The European Council at Lisbon set ambitious targets for raising employment rates in the Union by 2010, to close to 70% for the working-age population as a whole, to over 60% for women and to 50% for older workers. A considerable number of inactive people will need to enter the labour market to reach the Lisbon objectives. If it is clear that raising employment rate is directly linked to raising levels of participation, reducing unemployment will also have to play a role. An increase in participation rates will depend on changes in both cultural and socio-psychological factors, so that governments and social partners will need to co-operate in reforming the legal and institutional framework. This is particularly true for Italy where women continue to be primarily responsible for childcare and other nonmarket services.

There are many economic explanations brought forward to account for women's labour market behaviour. Some studies focus on the role that human capital accumulation and work orientation plays, so that women who invest more in education have a lower probability to exit the labour market (Becker 1991; Goldin 1990; Mincer 1985; Smith and Ward 1985). Other studies look at the effect of labour market structure, opportunities and regulations, while some others analyse the institutional context, like the presence and affordability of child-care (see del Boca et al., 2007). Finally, many sociologist and demographers have used gender role and work attitudes (e.g. Vella 1993 and 1994; Moen et al. 1997, Fortin 2005, Farre' and Vella 2007) to characterize women's labour market participation.

Over the last two decades Italian women have increasingly entered the labour market: the female employment rate increased from 35.4% in 1994 to 47.2% in 2008. However, the recent global crisis, originating in the financial and in the real estate sector, has exerted disruptive effects in the real sector as well interrupting this upward trend and leaving the women employment rates in 2009 to come back to their level in 2006. In light of these difficulties it is of primary interest to gauge those factors mining at increasing the gender gap in earnings and occupations, as in order to meet familial obligations many women would decide to drop out of the labour force entirely (while some other will look for a part-time job).

The gender gap in occupations has been shown to increase with the number of children

(Eurostat, 2008). We offer a perspective to analyze the negative association between the number of children and the female labour force participation. Some clues of a reversal of the sign from negative to positive of the relationship between participation and fertility emerge from plotting the data for the Italian regions in years 1993 and 2008 (see Figure 1). We argue that the causal effect of the number of children on female labour force participation may be complicated by the endogeneity of fertility. We address the endogeneity problem by using an exogenous variation in family size based on infertility shocks. Infertility is a plausible instrument for the number of children as it is virtually random after controlling for age and health. This is shown to be a valid instrument for Italy, that together with Spain, has entered at the beginning of the 90s in the lowest-low regime, i.e. total fertility rate below 1.3 per woman. As only few women will have more than two children, the exogenous variation in family size based on either twins at the first birth (Rosenzweig and Wolpin, 1980a and 1980b, Bronars and Grogger 1994; Jacobsen et al. 1999) or the sex composition of the first two children (Angrist and Evans 1998; Cruces and Galiani 2007) is not suitable for the Italian setting.

The empirical analysis is based on the Bank of Italy's Survey on Household Income and Wealth (SHIW hereafter) for 2008, provided with a question explicitly asking for the number of children a woman had during her life. Women were also asked to give a reason for the possible mismatch between the wished and achieved number of children. As biological/physiological reasons were cited as responsible for the mismatch, we build an instrument for the number of children, which is suitable for women with almost completed fertility only. Our estimates suggest that children do not have any causal impact on the Italian female labour force participation; we interpret these findings as long run effects of fertility on women labour attachment. The same results are found when we exploit data from the Istat Birth Survey (BS, hereafter) for 2004 referred to the same cohort of women.

The reminder of the paper is organized as follows. In Section 2 the literature on exogeneity/endogeneity of fertility is reviewed. Section 3 presents the data available for Italy and the methodology adopted, while the main results and implications are summarized in Sections 4 and 5. Section 6 concludes.

# 2 The effect of fertility on labour force participation

Numerous earlier studies have examined the implications of the presence of children for women's labour supply (Mincer 1962; Cain 1966; Heckman 1974); the majority of such studies find a negative correlation between presence (or number) of children and maternal labour supply. The number of children a woman has could in principle influence (be influenced by) her labor force participation. That is, women who decide to have (more) children are not a random subgroup of the population and, compared to other women, they may have different observed and unobserved characteristics. On one side, they may be more family oriented and, because of this preference, they could accumulate lower human capital and present a lower labour market attachment. On the opposite side, women with high career perspectives due to unobserved components (like talent and ambition) may choose to have few children and be overrepresented in the labour force. This is commonly referred to as endogeneity of fertility decisions. As these unobservables are arguably correlated negatively with fertility and positively with participation, omitting them would result in an upward bias of the estimates.

Browning (1992) argues that despite a wide number of published papers find a significative and negative relationship between fertility and female labour supply, they are not assessing a causal effect due to endogeneity problems. Failure to account for the endogeneity of fertility may induce a bias in the estimates of fertility because of the presence of omitted factors.

The correlation between the unobserved processes that underlie fertility decisions and female labour supply has long been a concern among applied social scientists. Several studies have tried to overcome the biases potentially induced by this correlation by taking advantage of exogenous changes in family size in order to identify the causal relationship between fertility and employment. The pioneering paper using twinning at first birth as a valid instrument for fertility is Rosenzweig and Wolpin (1980a and 1980b) showing that an exogenous variation in family size does not impact on female labour participation over the life cycle. A similar identification strategy can be found in Bronars and Grogger (1994) estimating short and long run effects of unplanned children on unwed mothers and finding that unplanned births have only short term effects on unwed mothers labor-force participation,

but not among married mothers; additionally these effects dissipate over time for whites and are more persistent for blacks. The impact of an unplanned (twin) motherhood is studied more deeply in Jacobsen et al. (1999) underlining that the effects on married female labour supply are negligible in the long run, while the impact on earnings is more persistent.

An alternative identification strategy for the effect of childbearing on labour supply is based on the sex composition of the first two children: the paper by Angrist and Evans (1998) underline that IV estimates for women are attenuated with respect to OLS one, being the effect much smaller for more educated. The results for the US are thus generalized to the populations of two developing countries (Argentina and Mexico) by Cruces and Galiani (2007).

Since sibling sex composition is showed to affects women's educational attainment and to be unrelated to other determinants of earnings, it may provide a useful instrument for education in earnings functions for women (Butcher and Case 1994).

Other studies have used the occurrence of miscarriages as an instrumental variable to evaluate the effect of teenage childbearing on female labour supply and other outcomes (see Hotz et al. 1997 and 2005; Ermisch and Pevalin 2003 and 2005). In particular Ermisch and Pevalin (2005) show that a teen-birth does not cause a woman to be unpartnered at age 30 but increases her chances to be partnered with a poorly educated and unemployment-prone man.

More recent research employs other types of fertility 'shocks'. For instance, infertility or subfecundity problems and births occurred when using contraceptives have been used to estimate the impact of motherhood timing on earnings, wage rates and working hours (Miller 2008) and the impact of the number of children on mother's labour force participation (Aguero and Marks 2008). A similar identification strategy can be found in Cristia (2008), in which the instrumental variable was whether or not women searched for help for their first pregnancy. Cristia analysed the effect of the first child on the labour supply of all women who searched for help, by comparing those who, after a certain period of time, gave birth to those who did not. She finds that a first child younger than one year old reduces female employment by 26 percentage points.

To sum up, the literature analyzing the impact of childbearing on female labour market

participation by using an exogenous variation in family size seems to distinguish between short and long run effects. More precisely, it has been proved that the negative association between fertility and female labour supply, usually found in the short run, dissipates over time; some papers (Bronars and Grogger, 1994 and Jacobsen et al., 1999) used Census data to follow cohorts of women to assess these effects.

Our identification strategy most closely resembles that in Aguero and Marks (2008), as we use an exogenous variation in family size due to infertility shocks. The definition of infertility used in this paper relates to the fact that during their life women may have (not) achieved their wished number of children. Biological/physiological factors are cited as a reason for a mismatch between the actual and the desired number of children. This indicator for infertility status enables us to identify the causal effect of fertility on the Italian female labour force participation. We also aim at capturing the short and long run effects of fertility by splitting the women sample according to the age of the child.

# 3 Data and methods

We use data from the 2008 edition of the Bank of Italy's Survey on Household Income and Wealth, whose sample is composed of 7,977 households, representative of the whole Italian population (Bank of Italy 2009).

Women between the ages of 18 and 64 answered questions about their birth history and fertility preferences. Specifically, they were asked about the number of the children they had, both cohabiting or not. The SHIW is provided with a question explicitly asking for the number of children a woman had during her life. The practice to consider children living at home at the moment of the interview as a proxy for the number of children the woman gave birth to has been widely used in the economic and demographic literature. Inferring the number of children from the household composition can however be a source of bias, since it only catches cohabiting children, with a plausible underestimation of family size for the oldest women.

Women aged between 18 to 45 were asked if they plan to have (more) children in the future. To all women with almost completed fertility (46-64 years old) with children it

was asked if the actual number of children was that wished or if she would have liked to have more (or less) children. For childless women the question was related to the desire to have children. All women answered to a question about the reasons for not having (further) children; possible answers included: insufficient income, incompatibility with work, not suitable home, lack of a regular help from relatives, no nursery schools nearby or too expensive, need to care for other relatives, absence of a partner to have children with, lack of agreement with the partner about the number of children, biological/physiological reasons.

Fertility preferences could not be completely formed for young women: in 2008 Italian mean age at the first birth was 31 and it is likely that most women aged below this threshold had never tried to have a child, so we dropped them from the sample. Moreover, our instrument would not be valid if the physiological reasons blamed for the mismatch are rather the effect of a postponement choice. For these reasons, we concentrate on women once they have reached, or are close to, the end of their reproductive life (completed fertility). More precisely we consider women with at least 39 years old: this makes the original sample, composed of 1,836 women, lessen to 1,358 women. The choice of this threshold is also made in order to analyse the same cohort of women observed in another data source we will rely upon in this paper, the Istat Birth Survey (see Section 4).

Women replying that the biological/physiological factors hampered the possibility of having (further) children have been defined as infertile. They represent the 7.5% of the sample (see Table 1). This self-reported infertility is expected to be a good predictor of family size and to improve with respect to other instruments such as twinning and sex composition of the first two children, as it does not require families to have at least two children. It also allows considering the women's behavior at any parity, including those childless. Infertile reasons are cited as the most frequent reasons for not having (other) children both for childless women with a partner and women with children (on average 1 out of 5).

We model the probability for a woman of participating to the labour market, where the dependent variable is equal to one if she has reported to have been working for pay during the year and zero otherwise. In the sample, about 46.7% of the women participated in the labour force, replicating quite well the actual employment rate in the age class 39-64, equal to

47.5%; 85% of them have at least one child and the average number of children per woman is 1.7. The probability of being employed is set to depend on several individual and household characteristics and takes the following form:

$$Pr(p_i = 1) = \alpha + \beta K_i + \mathbf{X}_i'\gamma + \epsilon_i \tag{1}$$

where $p_i$ is equal to one if the $i$-th woman is employed and zero otherwise. $K_i$ captures the number of children the woman gave birth to during her life so that $\beta$ is our coefficient of interest. To avoid the bias due to the fact that the number of children is a choice variable for the household we instrument $K_i$ with the infertility status of the mother. In a first specification of the model $\mathbf{X}_i$ includes age, education, geographical area of residence, marital status and self-reported health status. In a second step we also allow the model to control for the number of income recipients in the household (excluding the woman herself) and for the possession of non-labour income sources.

A list of the variables used and main descriptive statistics for fertile and infertile women are reported in Table 1. In order to formally test whether infertile women mirror their fertile counterparts, we regressed each variable ($V_i$) on age and health status - the two factors that need to be controlled for in order to equiparate fertility to a random assignment - separately on the two subgroups. Column (4) of Table 1 reports the results of the test of the difference between the predicted values in the two regressions. As expected, on average infertile women have less children. Conditionally on age and health, infertile women are more educated and more likely to be married. Moreover, infertility status is much widespread in the Isles, less in the South. It is then important to include these variables in our specifications.

We also perform several robustness checks. First, we focus on women living in couple (either married or cohabiting). Second, we take care of the endogeneity of the education choice. Third, we introduce further controls, such as happiness, foreign citizenship, and powers up to the third order for the parity to account for nonlinearities in this variable, as well as replace the parity with a dummy equal to one if the woman has children and zero if not. Fourth, the same specifications as above are estimated by excluding the household sampling weights as available in the SHIW dataset (Bank of Italy, 2009). Fifth, we split the sample by education and, against the background of a divide in the female participation to the labour

market between the Northern and the Southern regions of the country, by geographical area. Sixth, we assess whether fertility induces an adjustment of the women's labour supply not only in terms of participation but also at the intensive margin, by estimating the relation between either hours worked or type of working schedule (full-time, part-time, not working) and fertility. Finally, we look at outcomes accounting for the women's entire participation history, namely experience cumulated on the labour market and number of years when contributions have been paid (by either the employer or the woman herself). An external validation for the results of the paper is then obtained exploiting an independent dataset on births.

# 4 Baseline results

Both in the simple probit with a smaller set of controls and in the extension including additional controls we find a negative and statistically significant relation between the number of children and the probability of being employed (columns (1) and (2) in Table 2). One more child hampers this probability by 7 percentage points according to both specifications, which compares with an average observed employment probability of 47%, for women above 39. Women aged between 55 and 64 years old and those living in the South of Italy and in the Isles are less likely to work; the probability increases with education (with a significant coefficient only for those who have achieved at least a diploma). Being married has a negative association with participation. Women perceiving other income sources are more likely to work, while the coefficients for the health status and the number of recipients in the household are not significant.

Switching to the IV setup (column (3) in Table 2), the impact of the parity on the participation status loses statistical significance, and even reverses its sign from negative to positive. The Wald test accepts the null hypothesis of exogeneity at standard confidence levels.

The fact that Italian children are not an obstacle for the female involvement in the labour market is consistent with the evidence found at a cross-country level of a reversal of the correlation between fertility and female employment in the industrialised economies

at the end of the 80s (Ahn and Mira 2002) and with recent findings for a panel of Latin American countries (Aguero and Marks 2008). Our first stage results in the bottom part of column (3) in Table 2 confirm that the infertility status is a relevant instrument for the parity, as the corresponding coefficient is highly significant. The number of children is on average lower by 0.7 if the woman is infertile; this result is in line with that in Aguero and Marks (2008) finding that on average infertile women have one fewer child. For our instrument to be also valid we have to postulate that infertility does not affect the working status of the woman if not through the number of children; in other words, infertility must not be correlated with omitted variables in the second stage. As we have controlled for both age and health status, namely the two main factors that according to the medical literature are associated with infertility, we can credibly identify the causal impact of the number of children on the participation status.

The selection of partnered women only (either married or cohabiting) restricts our sample to 1,007 women. Both the infertility status of the woman and the length of the marriage/cohabitation are used as instruments to assess the endogeneity of the number of children; in addition we introduce some characteristics of the partner, such as age and schooling. [1] As Table 2 shows (columns (4) and (5)) we obtain a negative coefficient in the specifications where fertility is a choice variable, while the coefficient collapses to a value not statistically distinguishable from zero - again with a sign reversal - when the infertility instrument is used. In addition, in the first stage the length of the marriage/cohabitation has a positive and strongly significant effect on the number of children, as expected.

As a whole our results are left unaltered when further sensitivity exercises are performed, as reported in the following Section.[2]

# 5 Robustness analysis

On the grounds that family background matters in children's schooling achievement (see for example for Italy Cingano and Cipollone 2007), we account for the endogeneity of the

[1] Due to assortative mating issues, to avoid collinearity with the spouse's schooling we introduce a dummy equal to 1 if husband and wife reached a different qualification and zero otherwise.

[2] Thereafter, all estimates which are not fully reported for the sake of brevity are available upon request.

education choice by introducing the educational level of the mother as an instrument for the education of the daughter. The schooling of the mother is found to be strongly and positively correlated with her daughter's education, as one would expect, but this does not lead to significant changes in our coefficient of interest.

The additional controls never exhibit a significant relation with labour market participation. Their inclusion in our models, as well as the change in the definition of fertility (either using a dummy or introducing powers of the parity), neither alter the results on our variable of interest nor improve the explanatory power of our specifications. Omitting the sample weights makes no difference as well.

When women are divided into two groups depending on their education we find that the negative relationship between participation and fertility is entirely due to the less educated, as for the more educated the coefficient is negative but not significant. When the IV strategy is applied the negative correlation vanishes in both subgroups (Table 3). One could argue that a strong family orientation shapes not only the choice of participating to the labour market but also the education choice; once this issue and the exogenous variation in the number of children induced by the infertility status is taken into account, there are no differences left that can be attributed to the skill level. Also geography seems not to be a dimension along which the relation between participation and fertility varies substantially, as the separate estimation of the models on women living in the Center-North and in the South leads in both areas to a negative and significant coefficient in the simple probit regressions, collapsing (statistically) to zero when the instrument is used (see Table 3). In Figure 2 we have plotted the predicted probabilities of being employed by number of children using the two model specifications. The bottom panel of the Figure shows that despite the almost identical reaction to an additional child (with Southern women finding it more difficult to conciliate family and work), when the endogeneity problem is taken into account (Southern) Northern women (de)increase their labour market attachment as the parity grows, the difference attaining 30 percentage points for the third child.

In order to assess the effect of fertility on labour supply at the intensive margin we estimate a Tobit model for hours worked (which are zero for unoccupied women). Ignoring the endogeneity of fertility we obtain that one additional child downsizes the working time

by around 5 hours per week, which compares with an average of 35 weekly hours of work (calculated on employed women); when the instrument is used we find that a further child causes 3.6 extra hours worked, though the coefficient is not statistically significant. Thus, results found for the extensive margin are broadly confirmed. The ordered probit regressions considering three status - working full-time, working part-time and not working - provide the same picture. One additional child increases the probability of not working, equal to 53 per cent in our sample, by almost 3.5 percentage points; and affects negatively the probability of being full-time and part-time respectively by 1.9 and 1.7 percentage points (on average equal to 30 and 16 per cent in the sample, respectively). When we get rid of the endogeneity problem the sign of the three coefficients is reversed, but statistical significance is not achieved.

As far as outcomes accounting for the entire working history are concerned, considering either the (potential) experience or the years of contributions as the outcome variable does not change the bottom line message of this paper: whenever the endogeneity of fertility is properly taken care of, its coefficient passes from being negative to statistically nil.

Moreover, interesting insights for the interpretation of a positive, though not significant, coefficient for women can be drawn from a repetition of the same exercise on men. Should the reason be that more children require their mother to work whenever their father's income is not sufficient to grow them up (an income effect), we expect also men's supply to be positively affected by the number of children (see Table 3). Modeling the number of weekly hours worked as a function of the parity and of a set of socio-demographics variables, we can estimate that each additional child implies an increase by 1.1 hours worked per week (1.3 when also husbands of the youngest women are included), which compares with an average weekly working time of 43 hours.

## 5.1 Comparisons using the Birth Survey

In this section we compare the results obtained using the SHIW data with estimates from the Birth Survey (BS, thereafter), released by the National Institute of Statistics in 2004 and sampling mothers only. The survey collects data for 15,870 mothers in total and refers to a particular birth whose event on average took place 23 months before the interview;

information on subsequent (actually few) and previous births are available as well. For comparison reasons with the SHIW sample, we restrict the analysis to women aged 35 and over in 2004 and construct an alternative fertility instrument based on the reasons for not having any other children; this reduces the number of observations at 3,575. Women aged up to 45 with al least one children are asked if they plan to have more children in the future. In case of a negative answer they are also asked to give a reason for not having other children. The definition of secondary infertility[3] as an instrument for the econometric analysis includes all women replying that health and age factors hamper the possibility of having further children. Table 4 confirms that the effect of the number of children of female labour market participation is negative if the endogeneity problem is not taken into account. The statistically nil effect of children on women labour attachment, previously discussed and underlined in Table 2 for women in the SHIW sample aged at least 39, is confirmed when using the BS independent dataset and the secondary infertility instrument available therein. Unsurprisingly the estimated effects reported in Table 4 (column (1)) are lower than those reported in Table 3 (column (3)) as the secondary (occurring) infertility can be considered a subset of the general infertility definition we have been using so far in the paper. In particular, women aged at least 35, having at least one children and declaring not to have any other children have on average 0.3 less children than their counterpart citing other reasons for not giving birth to other babies (economic reasons, lack of a regular help from relatives, etc). The result is however attenuated with respect to that in Table 2, where the number of children is on average lower by 0.7 if the woman is generally infertile.

The fact that the children do not causally affect the women involvement in the labour market (column (1) of Table 4) is clearly affected by their children's age. The effect of the presence of a child younger than two years is found to reduce (though not significantly) the time a woman spends in a paid job, the reduction increasing as the number of children grows (see Figure 3). These effects dissipates over time, becoming positive (statistically zero), meaning that over the long run the presence of children seems to have a mild pushing effect

[3]Secondary infertility is medically defined as the inability to conceive or carry a pregnancy to term after successfully and naturally conceiving one or more children. Common explanations for secondary infertility include: ovulation problems, endometriosis, pelvic adhesions, uterine fibroids or polyps.

for mothers into the labour market.

# 6 Conclusions

Over the last two decades two prevalent trends have depicted the Italian setting: a decline in total fertility and a steady increase in women's educational attainment, together with higher female employment rates. The negative association between the presence of children and maternal labour supply has been accepted as an empirical regularity across various studies. We argue that these findings are not assessing a causal effect of fertility on the female labour market participation due to endogeneity problems.

This paper has investigated whether children matter in shaping Italian women's choice of being employed, using household data from the 2008 edition of the Bank of Italy's Survey on Household Income and Wealth. By exploiting the newly available information on the reasons for the mismatch between desired and actual number of children we build an instrument for fertility. As this type of fertility shock is likely to hit all women, even those childless, we solve the endogeneity problem that plagues this stream of literature in a way that fits quite well the Italian case, characterised by a total fertility rate of 1.4. The choice of this instrument allows to study the women behaviour at any parity, while standard instruments based on twinning at the first birth and on the sex mix of the first two children are suitable only for parities at least equal to two.

We find that the negative relationship between the number of children and women's labour force participation disappears after properly accounting for the endogeneity of fertility, suggesting that children have not a causal effect on the involvement of women in the labour market. This result is confirmed when the analysis is repeated on the Birth Survey, which allows to use an alternative instrument capturing secondary infertility only. Insights of differentiated effects according to the age of the child emerge.

Table 1: **Descriptive Statistics**

| | All women (1) | | | Fertile (2) | | | Infertile (3) | | | Test (4) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_i$ | Obs. | Mean | St. dev. | Obs. | Mean $\theta_1$ | St. dev. | Obs. | Mean $\theta_2$ | St. dev. | $\hat{\theta_1} - \hat{\theta_2} = 0$ | |
| Employed | 1358 | 0.47 | 0.50 | 1256 | 0.47 | 0.50 | 102 | 0.46 | 0.50 | -0.01 | [0.67] |
| Number of children | 1358 | 1.70 | 1.08 | 1256 | 1.75 | 1.07 | 102 | 1.00 | 0.91 | 0.74 | [0.00] |
| Infertility | 1358 | 0.07 | 0.26 | 1256 | 0.00 | 0.00 | 102 | 1.00 | 0.00 | | |
| 39-44 years old | 1358 | 0.33 | 0.47 | 1256 | 0.33 | 0.47 | 102 | 0.35 | 0.48 | | |
| 45-54 years old | 1358 | 0.34 | 0.48 | 1256 | 0.34 | 0.47 | 102 | 0.42 | 0.50 | | |
| 55-64 years old | 1358 | 0.32 | 0.47 | 1256 | 0.33 | 0.47 | 102 | 0.23 | 0.42 | | |
| No formal education | 1358 | 0.02 | 0.12 | 1256 | 0.02 | 0.12 | 102 | 0.01 | 0.08 | 0.01 | [0.00] |
| Primary school | 1358 | 0.19 | 0.39 | 1256 | 0.19 | 0.40 | 102 | 0.10 | 0.30 | 0.09 | [0.00] |
| Middle school | 1358 | 0.32 | 0.47 | 1256 | 0.33 | 0.47 | 102 | 0.20 | 0.40 | 0.12 | [0.00] |
| High school | 1358 | 0.38 | 0.49 | 1256 | 0.37 | 0.48 | 102 | 0.54 | 0.50 | -0.17 | [0.00] |
| Bachelor's degree and beyond | 1358 | 0.10 | 0.29 | 1256 | 0.09 | 0.29 | 102 | 0.15 | 0.35 | -0.05 | [0.00] |
| Married | 1358 | 0.73 | 0.45 | 1256 | 0.72 | 0.45 | 102 | 0.83 | 0.38 | -0.10 | [0.00] |
| Single | 1358 | 0.11 | 0.31 | 1256 | 0.11 | 0.32 | 102 | 0.06 | 0.24 | 0.05 | [0.00] |
| Separated/divorced/widow | 1358 | 0.16 | 0.37 | 1256 | 0.17 | 0.37 | 102 | 0.10 | 0.31 | 0.04 | [0.00] |
| North west | 1358 | 0.24 | 0.42 | 1256 | 0.23 | 0.42 | 102 | 0.25 | 0.43 | -0.03 | [0.00] |
| North east | 1358 | 0.21 | 0.41 | 1256 | 0.21 | 0.41 | 102 | 0.22 | 0.42 | 0.00 | [0.93] |
| Center | 1358 | 0.19 | 0.40 | 1256 | 0.19 | 0.40 | 102 | 0.19 | 0.39 | 0.00 | [0.84] |
| South | 1358 | 0.28 | 0.45 | 1256 | 0.29 | 0.45 | 102 | 0.15 | 0.36 | 0.13 | [0.00] |
| Isles | 1358 | 0.09 | 0.28 | 1256 | 0.08 | 0.27 | 102 | 0.19 | 0.40 | -0.10 | [0.00] |
| Healthy | 1358 | 0.85 | 0.35 | 1256 | 0.85 | 0.35 | 102 | 0.86 | 0.35 | | |
| No. perceivers except self | 1358 | 1.06 | 0.81 | 1256 | 1.07 | 0.82 | 102 | 0.95 | 0.64 | 0.01 | [0.00] |
| Recipient of other income | 1358 | 0.54 | 0.50 | 1256 | 0.55 | 0.50 | 102 | 0.50 | 0.50 | -0.75 | [0.66] |
| Mother's schooling | 1189 | 4.67 | 3.32 | 1095 | 4.61 | 3.32 | 94 | 5.38 | 3.23 | -2.57 | [0.00] |
| Partner's age | 1013 | 53.04 | 9.00 | 931 | 53.19 | 9.12 | 82 | 51.37 | 7.39 | 0.08 | [0.26] |
| Different schooling qualification | 1358 | 0.31 | 0.46 | 1256 | 0.31 | 0.46 | 102 | 0.25 | 0.43 | 0.00 | [0.00] |

*Source*: Our calculation from the SHIW, 2008.

*Notes*: Sample weights included. $p$-values in brackets. Column (4) reports the difference between fertile and infertile women of predicted values from separate regressions of $V_i$ where age and health status are included as controls.

Table 2: **The effect of children on women's labour market participation**

| | Women aged >= 39 | | | | |
|---|---|---|---|---|---|
| | All | | | Partnered | |
| Model: | probit | probit | IV probit | probit | IV probit |
| | (1) | (2) | (3) | (4) | (5) |
| Number of children | -0.0681*** | -0.0677*** | 0.0794 | -0.0640** | 0.0855 |
| | [0.0233] | [0.0236] | [0.0997] | [0.0262] | [0.0780] |
| 45-54 years old | 0.0457 | 0.0319 | 0.0201 | 0.0661 | 0.0463 |
| | [0.0486] | [0.0484] | [0.0477] | [0.0979] | [0.0940] |
| 55-64 years old | -0.297*** | -0.337*** | -0.325*** | 0.235*** | 0.202*** |
| | [0.0488] | [0.0500] | [0.0532] | [0.0692] | [0.0726] |
| Primary school | 0.0258 | 0.0422 | 0.000108 | -0.101 | -0.185 |
| | [0.181] | [0.174] | [0.161] | [0.161] | [0.130] |
| Middle school | 0.233 | 0.26 | 0.250* | 0.0349 | -0.0262 |
| | [0.170] | [0.160] | [0.147] | [0.175] | [0.149] |
| High school (diploma) | 0.310* | 0.337** | 0.360*** | 0.141 | 0.12 |
| | [0.164] | [0.155] | [0.138] | [0.177] | [0.151] |
| Bachelor's degree and beyond | 0.521*** | 0.526*** | 0.524*** | 0.444*** | 0.410*** |
| | [0.0829] | [0.0780] | [0.0719] | [0.149] | [0.137] |
| Single | 0.314*** | 0.277*** | 0.420*** | | |
| | [0.0695] | [0.0728] | [0.0913] | | |
| Separated/divorced/widow | 0.295*** | 0.250*** | 0.258*** | | |
| | [0.0478] | [0.0566] | [0.0557] | | |
| North east | 0.0266 | 0.0539 | 0.0619 | 0.067 | 0.0749 |
| | [0.0558] | [0.0571] | [0.0564] | [0.0644] | [0.0643] |
| Center | -0.0679 | -0.0662 | -0.0775 | -0.0788 | -0.0822 |
| | [0.0609] | [0.0607] | [0.0590] | [0.0640] | [0.0632] |
| South | -0.151** | -0.130** | -0.178*** | -0.102 | -0.149** |
| | [0.0591] | [0.0600] | [0.0629] | [0.0636] | [0.0643] |
| Isles | -0.221*** | -0.214*** | -0.214*** | -0.189*** | -0.167** |
| | [0.0654] | [0.0661] | [0.0630] | [0.0724] | [0.0753] |
| Healthy | 0.082 | 0.0816 | 0.0702 | 0.0242 | 0.0131 |
| | [0.0599] | [0.0600] | [0.0608] | [0.0686] | [0.0687] |
| No. perceivers except self | | 0.0229 | -0.005 | 0.0463 | 0.0205 |
| | | [0.0304] | [0.0344] | [0.0320] | [0.0332] |
| Recipient of other income sources | | 0.180*** | 0.172*** | 0.187*** | 0.173*** |
| | | [0.0458] | [0.0465] | [0.0470] | [0.0476] |
| Partner's age | | | | -0.0139*** | -0.0138*** |
| | | | | [0.00442] | [0.00412] |
| Difference with partner's schooling | | | | -0.0287 | -0.0357 |
| | | | | [0.0447] | [0.0432] |
| First stage (F-stat in brackets): | | | | | |
| Infertility | | | -0.703*** | | -.679*** |
| | | | [25.40] | | [16.728] |
| Length of marriage/cohabitation | | | | | 0.030*** |
| | | | | | [16.65] |
| Observations | 1,358 | 1,358 | 1,358 | 1,007 | 1,007 |
| Observed probability | 0.467 | 0.467 | 0.467 | 0.391 | 0.391 |
| Predicted probability | 0.456 | 0.456 | 0.458 | 0.360 | 0.369 |
| Wald test of exogeneity | | | [0.156] | | [0.06] |

*Source*: Our calculation from the SHIW, 2008. Standard errors in brackets. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. $p$-value for the Wald test statistic of exogeneity in brackets. Sample weights included.

Table 3: **Robustness checks**

| | Women aged >= 39 | | | | | | | | All husbands | Husbands with spouses aged >= 39 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Less Educated | | More Educated | | North/Center | | South | | | |
| Model | probit | IV probit | probit | IV probit | probit | IV probit | probit | IV probit | OLS | OLS |
| Dependent variable | Employed=1 | | | | | | | | | Weekly hours worked |
| Number of children | -0.0898*** | 0.0385 | -0.0199 | 0.0874 | -0.0499** | 0.0356 | -0.0433* | -0.0207 | 1.322*** | 1.122* |
| | (0.0281) | (0.107) | (0.0311) | (0.141) | (0.0224) | (0.117) | (0.0224) | (0.0748) | (0.477) | (0.631) |
| Controls | | | | | | | | | | |
| Age | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Education | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Marital Status | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Geographical Area | yes | yes | yes | yes | | | | | yes | yes |
| Healthy | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| No. perceivers except self | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Recipient of other income sources | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Experience | | | | | | | | | yes | yes |
| Occupational Status | | | | | | | | | yes | yes |
| Sector of activity | | | | | | | | | yes | yes |
| First stage: (F-stat in brackets) | | | | | | | | | | |
| Infertility | | -1.002 | | -0.588 | | -0.574 | | -1.139 | | |
| | | [36.000] | | [11.903] | | [30.030] | | [37.823] | | |
| Observations | 743 | 743 | 615 | 615 | 865 | 865 | 493 | 493 | 901 | 632 |

*Source*: Our calculation from the SHIW, 2008.

*Notes*: Standard errors in parenthesis. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Sample weights included. Less educated women includes women with no formal education, primary school and middle school, while those with at least a high school degree are considered more educated.

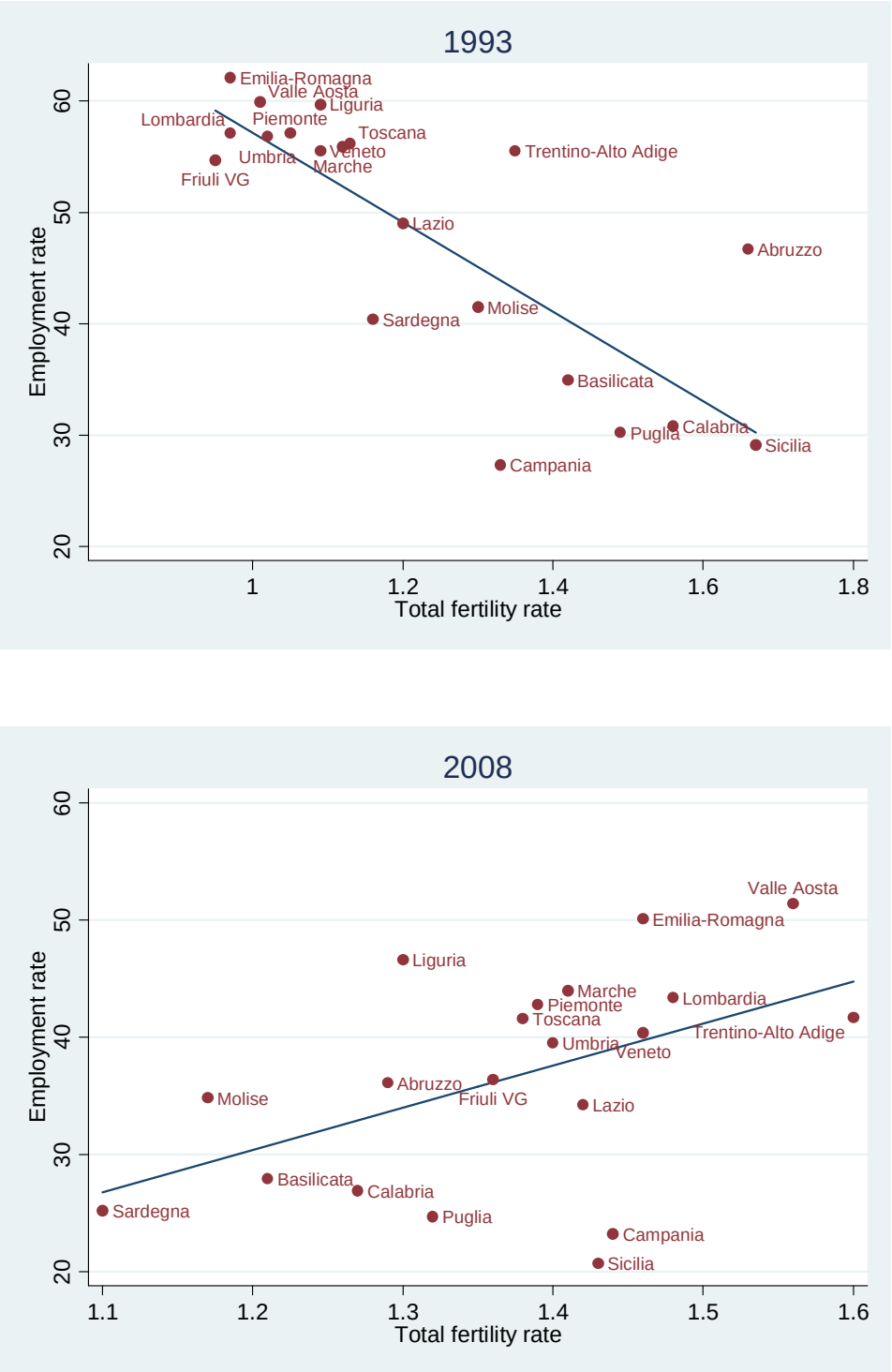
Table 4: **External validation for the effect of fertility on the participation**

| | All | | Child<=23 months | | Child>=24 months | |
|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | |
| Model | probit | IV probit | probit | IV probit | probit | IV probit |
| Number of children | -0.0614*** | -0.000198 | -0.0611*** | -0.0523 | -0.0560** | 0.0325 |
| | (0.0172) | (0.0790) | (0.0218) | (0.116) | (0.0246) | (0.101) |
| Controls | | | | | | |
| Age | yes | yes | yes | yes | yes | yes |
| Age of the child | yes | yes | | | | |
| Education | yes | yes | yes | yes | yes | yes |
| Marital Status | yes | yes | yes | yes | yes | yes |
| Geographical Area | yes | yes | yes | yes | yes | yes |
| Healthy | yes | yes | yes | yes | yes | yes |
| No. perceivers except self | yes | yes | yes | yes | yes | yes |
| First stage: (F-stat in brackets) | | | | | | |
| Infertility | | -0.344 | | -0.307 | | -0.389 |
| | | [76.56] | | [40.58] | | [40.45] |
| Observations | 3,575 | 3,575 | 1,914 | 1,914 | 1,661 | 1,661 |

*Source*: Our calculation from the Birth Survey, 2004.

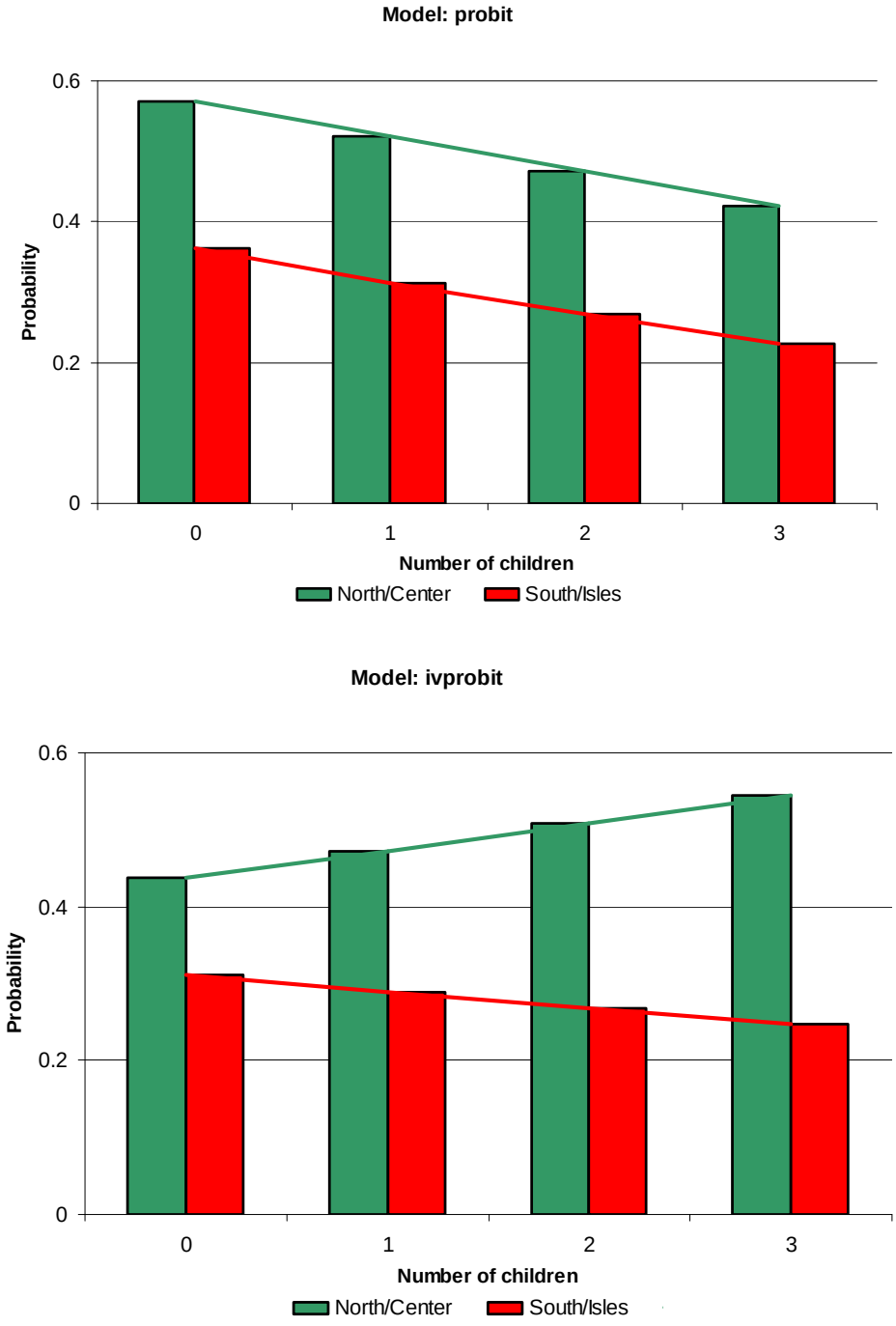
*Notes*: Sample weights included. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

**Figure 1: Employment and total fertility rates in the Italian regions**



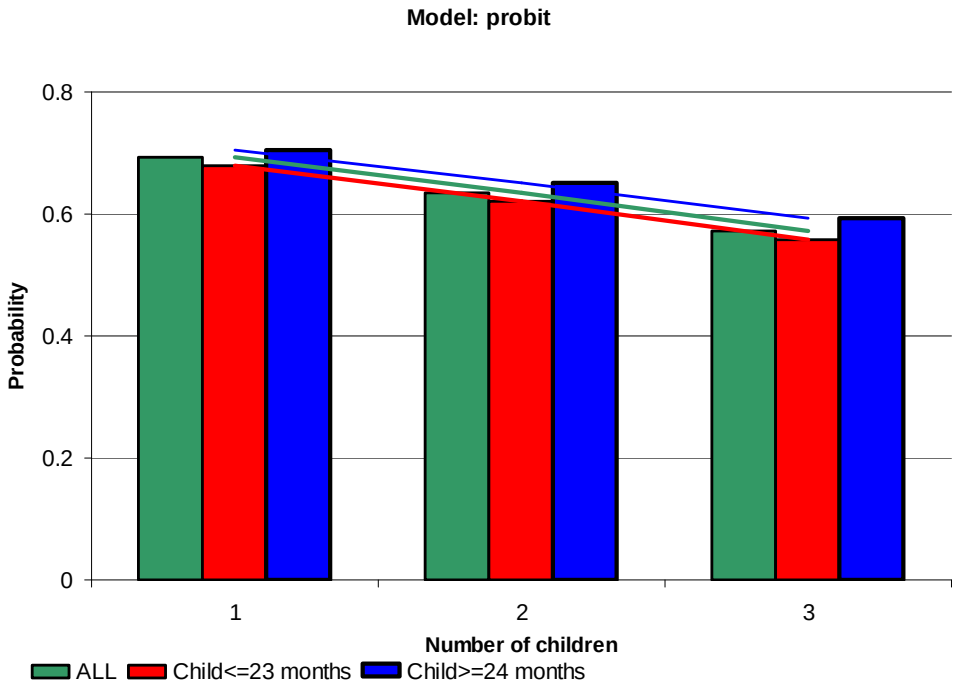

*Source*: Italian national institute of statistics, Istat.

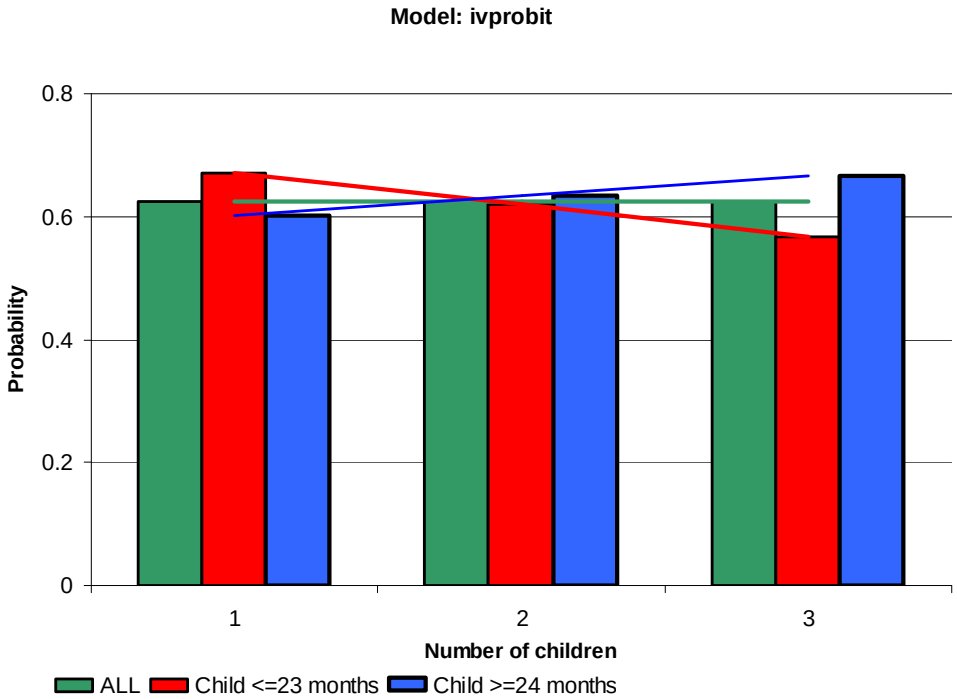
**Figure 2: Predicted employment probabilities by parity and geographical area**




*Source*: Own calculation from SHIW, 2008.

**Figure 3: Predicted employment probabilities by parity and age of the children**




*Source*: Own calculation from SHIW, 2008.

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