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(NON)PERSISTENT EFFECTS OF FERTILITY ON FEMALE LABOUR SUPPLY

by Concetta Rondinelli* and Roberta Zizza**

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. Despite a widely-documented reduction of female labour supply around childbirth, using the Bank of Italy's Survey of Household Income and Wealth (SHIW) we find that this effect dissipates over time, with some signs of penalties relating to job quality. Results are confirmed by exploiting the Istat Birth Survey, with insights of a different impact according to the age of the child.

JEL Classification: J13, J22, C25.
Keywords: participation, children, motherhood, female employment rate, Italy.

Contents

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1 Introduction[1]

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 the 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.

Many economic explanations are given 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 of exiting 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 still others analyse the institutional context, such as the presence and affordability of childcare (Del Boca et al. 2007).

Over the last two decades more and more Italian women entered the labour market: the female employment rate rose from 35.4% in 1994 to 47.2% in 2008; however, following the recent global crisis this upward trend came to a halt, and the female employment rate in 2009 slid back to its 2006 level. On the other hand, at the beginning of the 1990s Italy attained lowest-low fertility levels, i.e. a total fertility rate of below 1.3 children per woman, reaching 1.4 in 2008. Thanks to the increasing availability of childcare services and part-time

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jobs, especially in the Nordic countries, the association between fertility and employment at cross-country level turned positive in the last decade (Ahn and Mira 2002; Del Boca and Locatelli 2006; Del Boca et al. 2007). Italy is experiencing the same trend, although it is still lagging behind when compared to the European average.

The available literature for Italy is concentrated on mothers' participation behaviour around childbirth, showing that more than one fourth of women leave the labour market after a birth (Bratti et al. 2005; Casadio et al. 2008). However, evidence for the US (Bronars and Grogger 1994; Jacobsen et al. 1999) proves that this effect tends to dissipate over time. We aim at bridging this gap for the Italian case by looking at long-run effects of fertility and by investigating if penalties arise in terms of career prospects.

We analyse the impact of the number of children on female employment, arguing that the causal effect may be complicated by the endogeneity of fertility. Classical instruments relying 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) are not suitable for the Italian setting, as very few women have at least two children. We address this issue by using an exogenous variation in family size based on infertility shocks, in the vein of the recent literature looking at infertility as a plausible instrument, after controlling for age and health (Cristia 2008; Aguero and Marks 2008). We discuss the validity of these instruments, as awareness of infertility status requires women to have actually tried to conceive a baby (selection into attempt to conceive); moreover, once they have realized their infertile status, they may accordingly revise their employment choices (ex-post rationalization). We overcome these limitations by focusing on a sample of mothers.

The empirical analysis is based on the Bank of Italy's Survey of Household Income and Wealth (SHIW) for 2008. The survey explicitly asked for the number of children, whether cohabiting or not, a woman had during her life. Women were also asked to give a reason for the possible mismatch between the wished for 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. The validity of the instrument is then addressed by exploiting the 2004 wave

of the Istat Birth Survey (BS) based on a sample of mothers belonging to the same cohort of women.

Our estimates suggest that children do not have any causal impact on the Italian female labour force participation. As the sample is restricted to women aged at least 39, we interpret these findings as long-run effects of fertility on women labour attachment. Negative effects are found for mothers with younger children.

This paper is organized as follows. Section 2 reviews the literature on exogeneity/endogeneity of fertility. Section 3 describes the data available for Italy and the methodology adopted, while the main results and implications are presented in Section 4. Sensitivity analyses and an assessment of the instrument validity are discussed in Section 5. Section 6 concludes.

2 The effect of fertility on labour supply

Numerous earlier studies have examined the implications of the presence of children for women's labour supply (Mincer 1962; Cain 1966; Heckman 1974, amongst others). The majority of these studies find a negative correlation between the presence (or number) of children and maternal labour supply (see Del Boca et al., 2007 for cross-country comparisons). For Italy, Del Boca et al. (2000) find that the higher the number of children, the lower the probability of working for married women. According to Bratti et al. (2005), female participation after childbirth is higher for those working in the public sector or in large private firms, and lower for those without a contract. Casadio et al. (2008) show that in 2002 one fifth of mothers working before pregnancy leave the labour market in the two-year period surrounding childbirth.

The number of children a woman has could in principle influence (be influenced by) her labour force participation. That is, women who decide to have (more) children are not a random subgroup of the population and, compared to other women, 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. By contrast, women with strong career prospects due to unobserved components (such as talent and ambition) may choose to have few children and

be overrepresented in the labour force. Browning (1992) argues that despite a wide number of published papers which find a significative and negative relationship between fertility and female labour supply, they do not assess 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.

To overcome this bias scholars have used an exogenous variation in family size to identify the causal relationship between fertility and employment. The pioneering paper using twinning at first birth as an instrument for fertility is Rosenzweig and Wolpin (1980a and 1980b) showing that an unplanned birth does not impact on female labour participation over the life cycle. A similar identification strategy can be found in Bronars and Grogger (1994), who estimate short- and long-run effects of having twins in the first pregnancy for unwed mothers and find that unplanned births have only short-term effects on unwed mothers' labour supply, while they have no effects among married mothers. In addition, 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 ones, being the effect much smaller for the more highly-educated. The results for the US are thus generalized to the populations of two Latin American countries (Argentina and Mexico) by Cruces and Galiani (2007).

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

To evaluate the effect of teenage childbearing on the female labour supply and other outcomes, the occurrence of miscarriages has been used as an instrumental variable (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 of being partnered with a poorly-educated and unemployment-prone man.

Recent papers employ other types of fertility 'shocks'. Cristia (2008) analysed the effect of the first child on female labour supply instrumenting fertility with having sought help at the first pregnancy; she found that having a child under the age of one reduces women's employment probability by 26 percentage points. Other instruments such as infertility or subfecundity problems have been used to estimate the impact of the number of children on mothers' labour force participation (Aguero and Marks 2008) and the effect of motherhood timing on earnings, wage rates and working hours as in Miller (2010). The latter tackles the endogeneity of age at the first birth by considering conceptions that occurred when using contraceptives, although criticisms of this instrument could be raised as evidence for the US suggests that contraceptive failure rates are not randomly distributed in the population (e.g. they are higher for non-white women. See Peterson et al. 1998; Fu et al. 1999).

Moreover, the literature analysing the impact of childbearing on female employment by using an exogenous variation in family size seems to distinguish between short- and long-run effects. More precisely, it has been proven that the negative association between fertility and female labour supply, usually found in the short run for women with young children, dissipates over time; some papers (Bronars and Grogger 1994; 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 desired 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 of infertility status enables us to identify the causal effect of fertility on Italian female labour force participation. On the grounds that this instrument can be questioned due to the selection into attempting motherhood and the ex-post rationalization, we select a sample of mothers, hence women who have attempted and succeeded in conceiving a baby. We also aim at capturing the short- and long-run effects of fertility by splitting the 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 of Household Income and Wealth, a sample composed of 7,977 households, representing the whole Italian population (Bank of Italy 2010).

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 children they had, whether cohabiting or not. The practice of considering 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 older women.

Women aged from 18 to 45 were asked if they planned to have (more) children in the future. All women with almost completed fertility (46-64 years old) with children were asked if the actual number of children was the number wished for or if she would have liked to have more (or fewer) children. For childless women the question was related to the desire to have children. All women answered a question about the reasons for not having (further) children; possible answers included: insufficient income, incompatibility with work, an unsuitable home, lack of regular help from relatives, no nursery schools nearby or schools that were too expensive, the need to care for other relatives, the absence of a partner to have children with, a lack of agreement with the partner about the number of children, biological/physiological reasons (Table 1).

Women replying that the biological/physiological factors hampered the possibility of having (more) children were assigned an infertile status, which represents our instrument. Self-reported infertility is expected to be a good predictor of family size and an improvement on other instruments such as twinning and the sex composition of the first two children, as it did not require families to have at least two children. It also allows considering women's behavior at any parity, including childless women.

For our instrument to be valid, some sample restrictions apply. Fertility preferences cannot be completely formed for young women: in 2008 the 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. Moreover, our instrument would not be valid if the physiological reasons blamed for the mismatch are instead the effect of a postponement choice. For these reasons, we concentrate on women who have reached, or are close to, the end of their reproductive life (completed fertility). More precisely we consider women who are at least 39 years old: this narrows down the original sample, composed of 1,836 women, to 1,358 women. This threshold is also chosen 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 for 2004 (see Section 5.3).

In our final sample, 7.5% of the women are infertile. Biological/physiological 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; Table 1). Insufficient income, incompatibility with work, lack of a partner and other reasons have been frequently given; the role of nurseries seems, instead, to be rather limited.

We model the probability for a woman of being employed, where the dependent variable is equal to one if she reported having worked for pay during the year and zero otherwise. In the sample, about 46.7% of the women are working, 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 depends on several individual and household characteristics and takes the following form:

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

where p_i is equal to one if the i-th woman is employed and zero otherwise and F$(\cdot)$ is the Normal cumulative distribution function. K_i captures the number of children the woman gave birth to during her life so that β 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. $\mathbf{X}_i$ includes age, education, geographical area of residence, marital status, self-reported health status, number of income recipients in the household (excluding the woman herself) and possession of non-labour income sources.

A list of the variables used and the main descriptive statistics for fertile and infertile women are reported in Table 2. In order to test formally 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 2 reports the results of the test of the difference between the predicted values in the two regressions. As expected, on average infertile women have fewer children. Conditionally on age and health, infertile women are more educated and more likely to be married. Moreover, infertility status is much more widespread in the Isles, less so in the South. It is then important to include these variables in our specifications.

4 Baseline results

The negative association between the number of children and the probability of being employed, documented by many papers for the Italian economy (Del Boca et al. 2000 and 2004) is confirmed by our estimates (column (1) in Table 3). One more child hampers this probability by 6.8 percentage points, which compares with an average observed employment probability of about 47%, for women who are at least 39 years old. The coefficient is equal to -0.17, very close to that in Del Boca et al. (2004) and about half that in Del Boca et al. (2000), which is, however, referred to partnered women only.

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. Being married has a negative association with employment. The probability of working is higher for women perceiving other income sources, while the coefficients for the health status and the number of recipients in the household are not significant.

Switching to the IV setup (column (2) in Table 3), the impact of 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.[2]

The fact that in the long-run Italian children are not an obstacle for female participation

[2]When the IV approach is applied to the sample of youngest women (478 women aged 18-38) the coefficient is negative but statistically equal to zero. Estimates are, however, not reported since, as discussed in the previous Section, for this group of women the validity of our instrument can be compromised.

in the labour market is consistent with the evidence found at 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; Del Boca and Locatelli 2006; Del Boca et al. 2007) and with recent findings for a panel of Latin American countries (Aguero and Marks 2008). Our first stage results in the lower section of column (2) in Table 3 confirm that infertility status is a relevant instrument for 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 less child. For our instrument to be also valid we have to postulate that infertility does not affect the working status of the woman unless 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 employment status.

We also replicate our estimates using, as in Booth and Kee (2009), Bratti et al. (2005) and Casadio et al. (2008), the number of mother's siblings (origin-family size) as a determinant of fertility. This variable may proxy for a woman's preference (or 'taste') for children. This instrument is relevant and positively related to the number of children; furthermore, the results are remarkably similar to those obtained with the infertility instrument (column (3) in Table 3).

As is typical in this stream of literature, we focus on women in a couple (either married or cohabiting). The selection of partnered women only 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.[3] As Table 3 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

[3]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.

stage the length of the marriage/cohabitation has a positive and significant effect on the number of children, as expected. Using the number of siblings as an instrument provides a similar picture (column (6) in Table 3).

As a whole our results are left unaltered when further sensitivity exercises are performed, as reported in the following Section.[4]

5 Robustness analysis and extensions

Our baseline estimates have been replicated on specific subgroups; moreover, the results have been tested by changing in the employment equation either the list of the exogenous covariates or the way fertility is defined (Section 5.1). We also perform several robustness checks on the observed labour market outcomes in Section 5.2. We finally validate our infertility instrument in Section 5.3 using a subsample of women with at least one child as available from the SHIW and from the Istat Birth Survey.

5.1 Changing the determinants of employment probability

Arguably a strong family orientation shapes not only the choice of participating in the labour market, but also education choices. Education is thus likely to be endogenous, as women could anticipate their labour market behavior accumulating less human capital. We account for this endogeneity by introducing the educational level of the mother as an instrument for the education of the daughter, on the grounds that family background matters in children's schooling achievement (see, for example, Cingano and Cipollone 2007 for Italy). The schooling of the mother is found to be strongly and positively correlated with her daughter's education, as one would expect; however, the coefficient for fertility remains negative when fertility is assumed exogenous and nil when the endogeneity problem is accounted for.

Female employment in Italy varies substantially according to education attainment; useful insights could be drawn by splitting the sample into lowly- and highly-educated women. We

[4]Thereafter, all estimates which are not fully reported for the sake of brevity are available upon request, including those obtained omitting the household sampling weights as available in the SHIW dataset (Bank of Italy 2010).

find that the negative relationship is entirely due to the less educated; as for the more educated the coefficient is negative but not significant (Table 4, columns (1) and (3)). When the IV strategy is applied the negative correlation vanishes in both subgroups (Table 4, columns (2) and (4)); we could argue that there are no differences left that can be attributed to the skill level, once the endogeneity of fertility and education is addressed.

Geography is another key factor shaping the association between fertility and female labour supply. Differences in child care quantity and quality, the conditions of labour demand and the extent of migration flows reflect a sharp geographical North-South divide. The reversal of the sign from negative to positive of the work-family relation, found at the European level, seems to have occurred between 1993 and 2008 only for the Italian Northern regions (see Figure 1). Against this background, we estimate separate models on women living in the Center-North and in the South-Isles. Geography does not appear to be a dimension along which the relation between participation and fertility varies substantially, as the separate estimation leads in both areas to a negative and significant coefficient in the simple probit regressions (Table 4, columns (2) and (4)), collapsing (statistically) to zero when the instrument is used (Table 4, columns (6) and (8)), but still negative for the South-Isles. In Figure 2 we have plotted the predicted probabilities of being employed by number of children using the two model specifications. The lower panel of the Figure shows that, despite the almost identical reaction to an additional child (with Southern women finding it more difficult to reconcile family and work), when the endogeneity problem is taken into account (Southern) Northern women (de)increase their labour market attachment as the parity grows, with the difference attaining 30 percentage points for the third child.

The impact of the first child might be different from that of children of higher order, possibly creating more problems for reconciling work and family. Thus we replace the number of children with a dichotomous variable equal to one if the woman has children and zero if not. We also restrict our sample to the 531 women who have at most one child. Estimates, which are obtained through linear probability models and on their IV counterparts when fertility is a binary variable, confirm that there is no impact on employment (columns (1) and (2) in Table 5). To account fully for simultaneity issues we estimate jointly the employment and the fertility equations, leaving the errors of the two processes to be correlated. The two

decisions emerge as not correlated (column (3) in Table 5).

5.2 Going beyond participation

So far we have assessed whether fertility induces an adjustment of women's labour supply at the extensive margin. It is instead plausible that fertility could induce changes in employment behaviour at the intensive margin, or also influence mothers' careers, segregating them into less favourable types of contract or occupation, or ultimately being reflected in interrupted work histories. The results are summarized in Table 6.

First, 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 about 4 extra hours worked, though the coefficient is not statistically significant. Thus, results found for the extensive margin are broadly confirmed.[5]

We then investigated whether fertility matters in affecting other dimensions of job quality, such as working schedules (considering three statuses: working full-time, working part-time and not working), contract types (with a breakdown into not working, fixed-term contracts including collaborations and open-ended contracts including independent workers) and type of occupation (with a breakdown into not working, blue collar dependent workers, blue collar independent workers and white collars). Ordered probit regressions depict a negative effect when fertility is assumed to be exogenous. When we address the endogeneity problem the coefficient loses statistical significance but stays negative, pointing to a long-run penalty of being mothers on the quality of the job held.

Finally, as far as outcomes accounting for women's entire working histories are concerned,

[5]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. If the reason is that more children require their mother to work whenever their father's income is not sufficient to bring them up (an income effect), we also expect men's supply to be positively affected by the number of children. Modeling the number of weekly hours worked as a function of the parity and of a set of socio-demographics variables, we obtain 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.

Tobit estimates for the (potential) experience cumulated (calculated as the difference between age and age of entrance in the labour market) and for the number of years when contributions have been paid (by either the employer or the woman herself) confirm the bottom-line message of this paper: whenever the endogeneity of fertility is properly taken care of, there is no statistical support for a deterrent effect of fertility.

5.3 Assessing the validity of the instrument

The validity of the infertility instrument might be questioned due to selection into attempting motherhood and ex-post rationalization. In most cases women can only be aware of their infertility status if they have tried to conceive a baby; once they learn they are infertile, they could revise their employment choices accordingly. To overcome these limitations we need to focus on a sample of mothers,[6] extracted both from the SHIW and from the same cohort of women selected from the 2004 wave of the Istat Birth Survey.

The Birth 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 (rare) 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 to 3,575. Women aged up to 45 with at least one child 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[7] as an instrument for the econometric analysis includes all women replying that health and age factors hamper the possibility of having further children; they represent about 40% of the sample.

Table 7 confirms that the effect of the number of children on female labour market partic-

[6] As we look at mothers' labour market behaviour, concerns for a selection-into-motherhood bias could be raised. However, both Bratti et al. (2005) and Casadio et al. (2008) provide evidence in favour of an absence of this bias for the Italian setting.

[7] 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.

ipation is negative if the endogeneity problem is not taken into account. The statistically nil effect of children on women labour attachment is confirmed when using the BS independent dataset and the secondary infertility instrument available therein. In particular, women aged at least 35, with at least one child and declaring not to expect to give birth to other children in the future have on average 0.3 fewer children than their counterparts citing other reasons for not giving birth to other babies (economic reasons, lack of regular help from relatives, etc.). The result is unsurprisingly attenuated with respect to that obtained if the woman is generally infertile (-0.7, see Table 3).

The fact that children do not causally affect women's involvement in the labour market is clearly affected by their children's age (columns (3)-(6) of Table 7). The effect of the presence of a child under 23 months is found to reduce (though not significantly) the probability for a woman to be in a paid job, the reduction increases as the number of children grows (see Figure 3). These effects dissipate over time, becoming positive (statistically zero), meaning that over the long-run the presence of children seems to have a mild pushing effect for mothers into the labour market. Remarkably, a replication exercise on a comparable sample of women selected in the SHIW provides the same results, again with an attenuation of the coefficient for the infertility status in the first stage (column (8) of Table 7) when compared to the whole SHIW sample.

6 Conclusions

Over the last two decades two prevalent trends have characterised 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 do not assess a causal effect of fertility on female participation in the labour market 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 the 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 childless ones, we solve the endogeneity problem that plagues this stream of literature in a way that fits the Italian case quite well, characterised by a total fertility rate of 1.4. The choice of this instrument allows women's behaviour to be studied 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 equal to at least two.

This instrument might suffer from selection into attempts to conceive and ex-post rationalization: to overcome these limitations our original sample has been restricted to include mothers only and the analysis has been repeated on the Istat Birth Survey.

We find that the negative relationship between having an additional child and women's work status disappears after properly accounting for the endogeneity of fertility, suggesting that in the long-run children do not have a causal effect on female labour supply. Insights of differentiated impacts according to the age of the child emerge, as well as some signs of a negative effect on the quality of the job held.

Our results imply that targeting fertility and female labour supply is feasible, meaning that there is no trade-off between policies aiming at increasing both.

Table 1: **Mismatch between actual and wished for number of children**

	All		**Childless**		**With Children**	
Reasons:	**(A)**	**(A)/(B)**	**(A)**	**(A)/(B)**	**(A)**	**(A)/(B)**
Insufficient income	71	5.2%	12	6.6%	59	5.0%
Incompatibility with work	72	5.3%	11	6.1%	61	5.2%
Unsuitable home	23	1.7%	2	1.1%	21	1.8%
No regular help from relatives	26	1.9%	2	1.1%	24	2.0%
No nursery schools nearby or too expensive	4	0.3%	0	0.0%	4	0.3%
Caring for other relatives	18	1.3%	5	2.8%	13	1.1%
No partner to have children with	76	5.6%	55	30.4%	21	1.8%
Lack of agreement with partner on number of children	19	1.4%	6	3.3%	13	1.1%
Biological/physical reasons	102	7.5%	31	17.1%	71	6.0%
Other reasons	78	5.7%	22	12.2%	56	4.8%
No. of women	489		146		343	
Total No. of women (B)	**1,358**		**181**		**1,177**	

Source: Our calculation from the SHIW, 2008.

Table 2: **Descriptive statistics**

	All women (1)			Fertile (2)			Infertile (3)			Test (4)	
V_i	Obs.	Mean	St. dev.	Obs.	Mean θ_1	St. dev.	Obs.	Mean θ_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. of income recipients except self	1358	1.06	0.81	1256	1.07	0.82	102	0.95	0.64	0.12	[0.00]
Recipient of other income	1358	0.54	0.50	1256	0.55	0.50	102	0.50	0.50	0.01	[0.66]
Mother's schooling	1189	4.67	3.32	1095	4.61	3.32	94	5.38	3.23	-0.75	[0.00]
Partner's age	1013	53.04	9.00	931	53.19	9.12	82	51.37	7.39	-2.57	[0.26]
Different schooling qualification	1358	0.31	0.46	1256	0.31	0.46	102	0.25	0.43	0.08	[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 3: **The effect of children on women's employment**

	Women aged >= 39					
	All			Partnered		
Model:	probit	IV probit	IV probit	probit	IV probit	IV probit
	(1)	(2)	(3)	(4)	(5)	(6)
Number of children	-0.0677***	0.0794	0.176	-0.0640***	0.0855	0.14
	(0.0192)	(0.0867)	(0.117)	(0.0191)	(0.0697)	(0.119)
45-54 years old	0.0319	0.0201	0.00898	0.169**	0.156**	0.148**
	(0.0568)	(0.0584)	(0.0601)	(0.0672)	(0.0641)	(0.0711)
55-64 years old	-0.337***	-0.325***	-0.299***	-0.0645	-0.0456	-0.0363
	(0.0469)	(0.0457)	(0.0598)	(0.0863)	(0.0771)	(0.0642)
Primary school	0.0422	0.000108	-0.035	-0.101	-0.185	-0.217
	(0.136)	(0.126)	(0.126)	(0.160)	(0.132)	(0.134)
Middle school	0.260*	0.250*	0.225*	0.0349	-0.0262	-0.0573
	(0.135)	(0.128)	(0.135)	(0.159)	(0.146)	(0.144)
High school (diploma)	0.337**	0.360***	0.353***	0.141	0.12	0.1
	(0.143)	(0.131)	(0.135)	(0.181)	(0.175)	(0.179)
Bachelor's degree and beyond	0.526***	0.524***	0.502***	0.444***	0.410***	0.376**
	(0.0542)	(0.0490)	(0.0744)	(0.124)	(0.133)	(0.162)
Single	0.277***	0.420***	0.480***			
	(0.0604)	(0.0870)	(0.0793)			
Separated/divorced/widowed	0.250***	0.258***	0.250***			
	(0.0476)	(0.0450)	(0.0461)			
North east	0.0539	0.0619	0.0626	0.067	0.0749	0.0768
	(0.0421)	(0.0556)	(0.0683)	(0.0522)	(0.0776)	(0.0882)
Center	-0.0662**	-0.0775	-0.08	-0.0788	-0.0822	-0.0774
	(0.0297)	(0.0483)	(0.0628)	(0.0498)	(0.0752)	(0.0837)
South	-0.130**	-0.178***	-0.198***	-0.102*	-0.149***	-0.160**
	(0.0527)	(0.0559)	(0.0641)	(0.0541)	(0.0545)	(0.0692)
Isles	-0.214***	-0.214***	-0.202***	-0.189***	-0.167***	-0.151***
	(0.0563)	(0.0402)	(0.0284)	(0.0402)	(0.0287)	(0.0291)
Healthy	0.0816	0.0702	0.0608	0.0242	0.0131	0.00945
	(0.0617)	(0.0596)	(0.0537)	(0.0465)	(0.0423)	(0.0393)
No. of income recipients except self	0.0229	-0.005	-0.0227	0.0463	0.0205	0.0122
	(0.0347)	(0.0378)	(0.0472)	(0.0392)	(0.0463)	(0.0472)
Recipient of other income sources	0.180***	0.172***	0.156***	0.187***	0.173***	0.164***
	(0.0397)	(0.0414)	(0.0508)	(0.0467)	(0.0464)	(0.0422)
Partner's age				-0.0139***	-0.0138***	-0.0136***
				(0.00456)	(0.00374)	(0.00388)
Difference with partner's schooling				-0.0287	-0.0357	-0.0378
				(0.0541)	(0.0539)	(0.0535)
First stage (F-stat in brackets):						
Infertility		-0.703			-0.679	
		[15.68]			[10.96]	
Number of siblings			0.088			0.09
			[25.60]			[18.32]
Length of marriage/cohabitation					0.0297	
					[9.18]	
p-value, Wald test of exogeneity		0.088	0.156		0.042	0.126
p-value, Hausman test		0.0852	0.042		0.0498	0.1
Observations	1,358	1,358	1,358	1,007	1,007	1,007
Observed probability	0.467	0.467	0.467	0.391	0.391	0.391
Predicted probability	0.456	0.458	0.460	0.360	0.369	0.374

Source: Our calculation from the SHIW, 2008.

Notes: Marginal effects reported. Standard errors clustered at the regional level in brackets. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Sample weights included.

Table 4: **The effect of children on women's employment**

	Less Educated		More Educated		North/Center		South/Isles	
Model	probit	IV probit	probit	IV probit	probit	IV probit	probit	IV probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of children	-0.0898***	0.0385	-0.0199	0.0874	-0.0499**	0.0356	-0.0433*	-0.0207
	(0.0194)	(0.0613)	(0.0255)	(0.114)	(0.0224)	(0.117)	(0.0224)	(0.0748)
Controls:								
Age	yes	yes	yes	yes	yes	yes	yes	yes
Education	yes	yes	yes	yes	yes	yes	yes	yes
Marital status	yes	yes	yes	yes	yes	yes	yes	yes
Geographical area	yes	yes	yes	yes				
Healthy	yes	yes	yes	yes	yes	yes	yes	yes
No. of income recipients except self	yes	yes	yes	yes	yes	yes	yes	yes
Recipient of other income sources	yes	yes	yes	yes	yes	yes	yes	yes
First stage: (F-stat in brackets)								
Infertility		-1.002		-0.588		-0.574		-1.139
		[25.60]		[20.43]		[30.03]		[37.82]
Observations	743	743	615	615	865	865	493	493

Source: Our calculation from the SHIW, 2008.

Notes: Marginal effects reported. Standard errors in parenthesis, clustered at the regional level when the sample is split by education. 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 highly-educated. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 5: **Effect of having children on female employment**

Model	Linear probability model		Joint estimation
	(1)	(2)	(3)
Having children=1			
	-0.103*	0.216	-0.086
	(0.061)	(0.268)	(0.820)
Controls:			
Age	yes	yes	yes
Education	yes	yes	yes
Marital status	yes	yes	yes
Geographical area	yes	yes	yes
Healthy	yes	yes	yes
No. of income recipients except self	yes	yes	yes
Recipient of other income sources	yes	yes	yes
First stage: (F-stat in brackets)			
Infertility		-0.233	
		[14.29]	
ρ (p-value)			-.128(0.764)

Source: Our calculation from the SHIW, 2008.

Notes: Coefficients reported. Sample size: 1,358 women. Sample weights included. Robust standard errors in parentheses. P-value for the absence of correlation between the fertility and employment process reported. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 6: **Effect of the number of children on different outcomes**

Outcome	Model	Number of children	
		Without instrument	With instrument
Weekly hours worked (in log)	Tobit	-0.022***	0.023
Years of contribution (in log)	Tobit	-0.015***	-0.015
Working time	Ordered probit	-0.075*	-0.049
Type of contract	Ordered probit	-0.143***	-0.058
Job quality	Ordered probit	-0.157***	-0.072
Potential experience (in log)	Tobit	-0.015***	-0.015

Source: Our calculation from the SHIW, 2008.

Notes: Coefficients reported. Sample size: 1,358 women. Standard controls listed in Table 3 and sample weights included. Potential experience is the difference between age and age of entrance in the labour market. Working time includes: full-time, part-time and women not in employment. Type of contracts considered are open-ended and fixed-term contracts and women not in employment. The job quality is constructed considering not working, blue collar dependent workers, blue collar independent workers and white collars. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

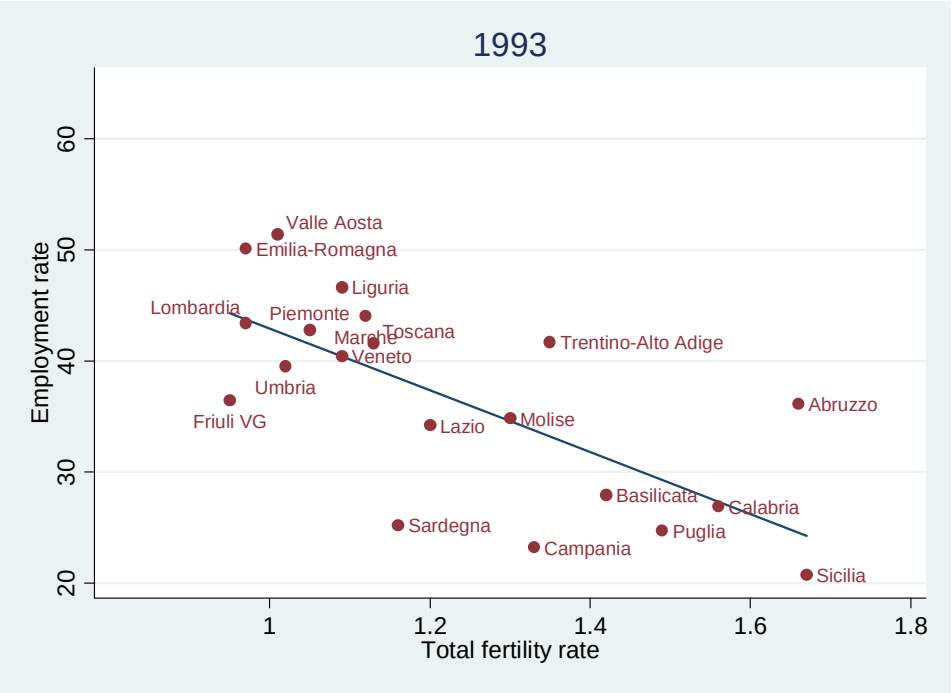
Table 7: **Assessing the validity of the infertility instrument**

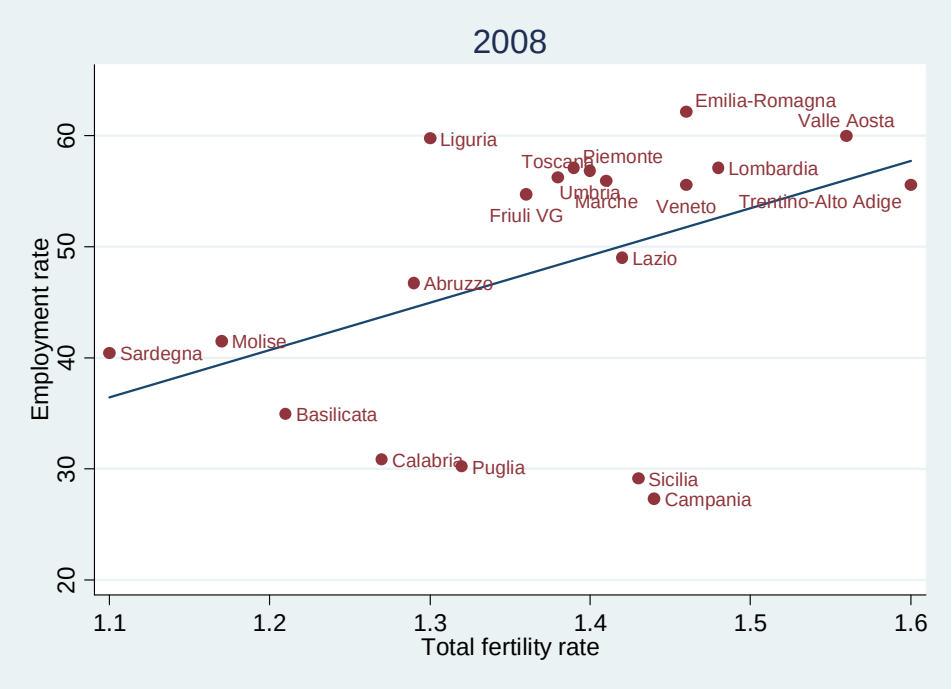
	Birth Survey						SHIW	
	Mothers		Child<=23		Child>=24		Mothers	
Model	probit	IV probit	probit	IV probit	probit	IV probit	probit	IV probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of children	-0.0614***	-0.000198	-0.0611***	-0.0523	-0.0560***	0.0325	-0.0680***	0.16
	(0.0076)	(0.0687)	(0.0200)	(0.137)	(0.0179)	(0.0785)	(0.0197)	(0.163)
Controls:								
Age	yes	yes	yes	yes	yes	yes	yes	yes
Age of the child	yes	yes						
Education	yes	yes	yes	yes	yes	yes	yes	yes
Marital status	yes	yes	yes	yes	yes	yes	yes	yes
Geographical area	yes	yes	yes	yes	yes	yes	yes	yes
Healthy	yes	yes	yes	yes	yes	yes	yes	yes
No. of income recipients except self	yes	yes	yes	yes	yes	yes	yes	yes
Recipient of other income sources							yes	yes
First stage: (F-stat in brackets)								
Infertility		-0.344		-0.307		-0.389		-0.405
		[44.22]		[50.84]		[35.52]		[8.237]
Observations	3,575	3,575	1,914	1,914	1,661	1,661	1,177	1,177

Source: Our calculation from the SHIW, 2008 and Birth Survey, 2004.

Notes: Marginal effects for the effect of the number of children on women's employment. Standard errors clustered at the regional level. Sample weights included. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

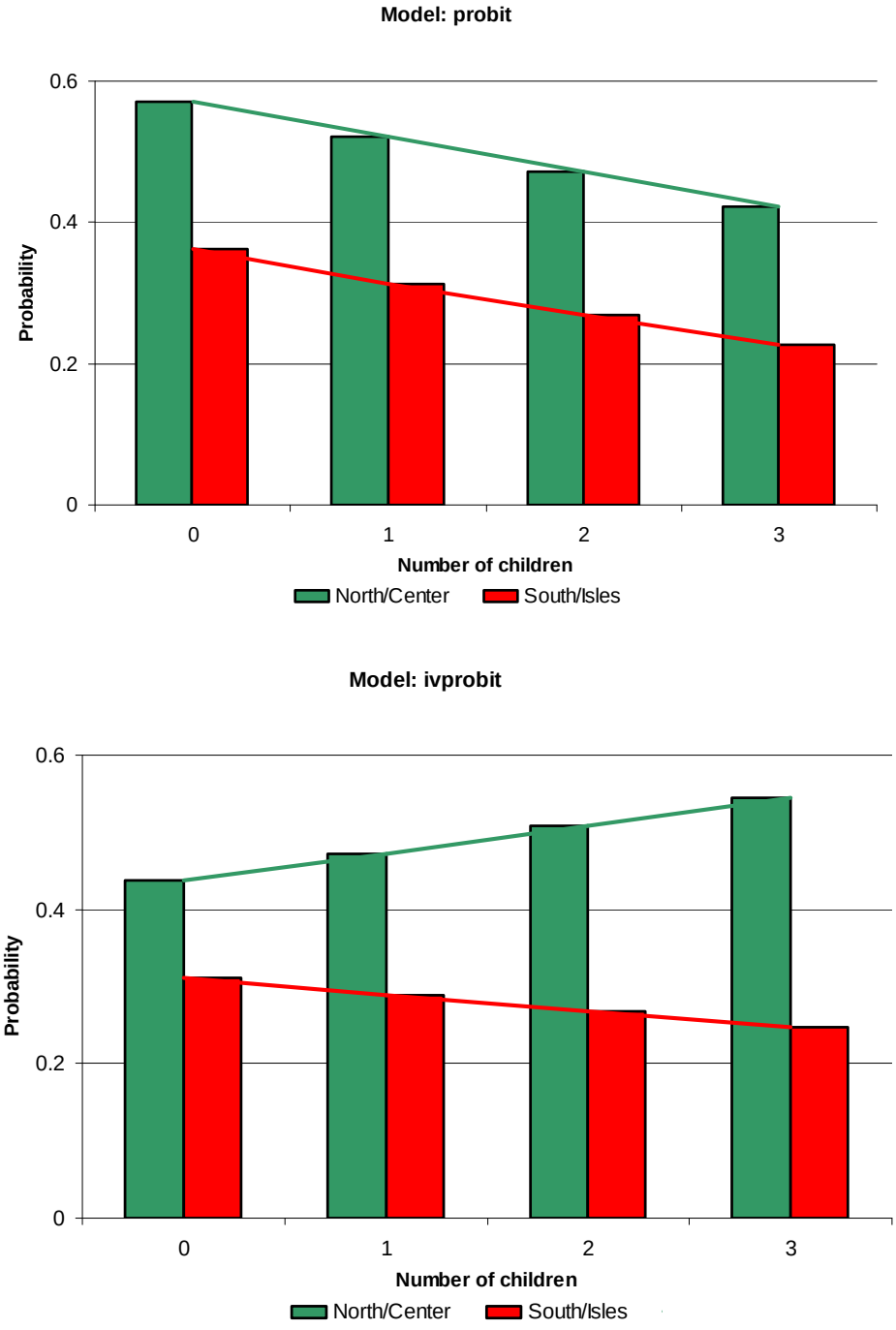
Figure 1: Employment and total fertility rates in the Italian regions





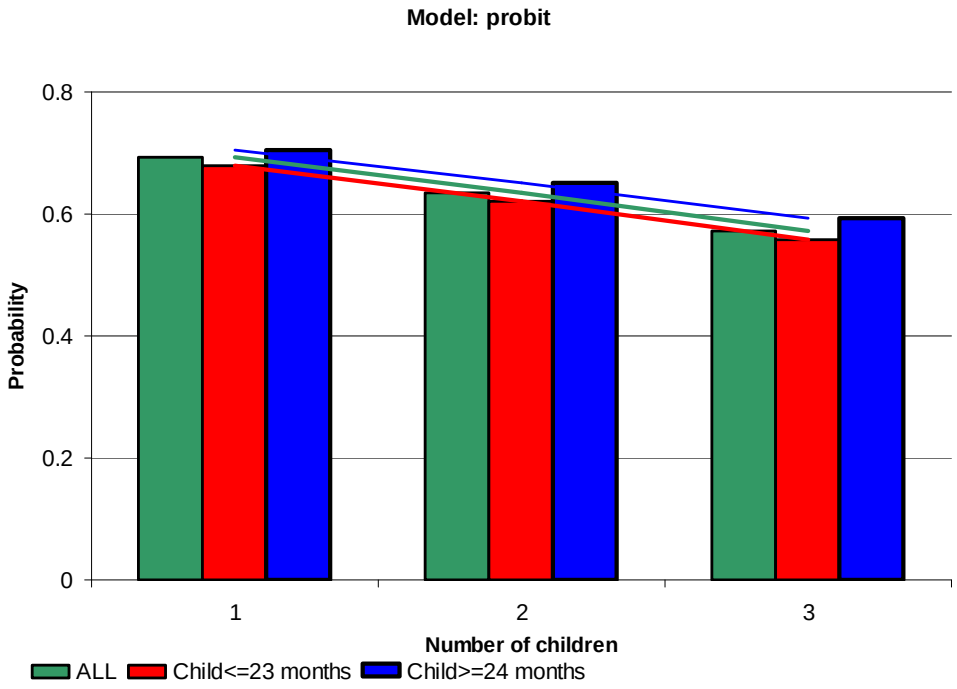
Source: Italian national institute of statistics, Istat.

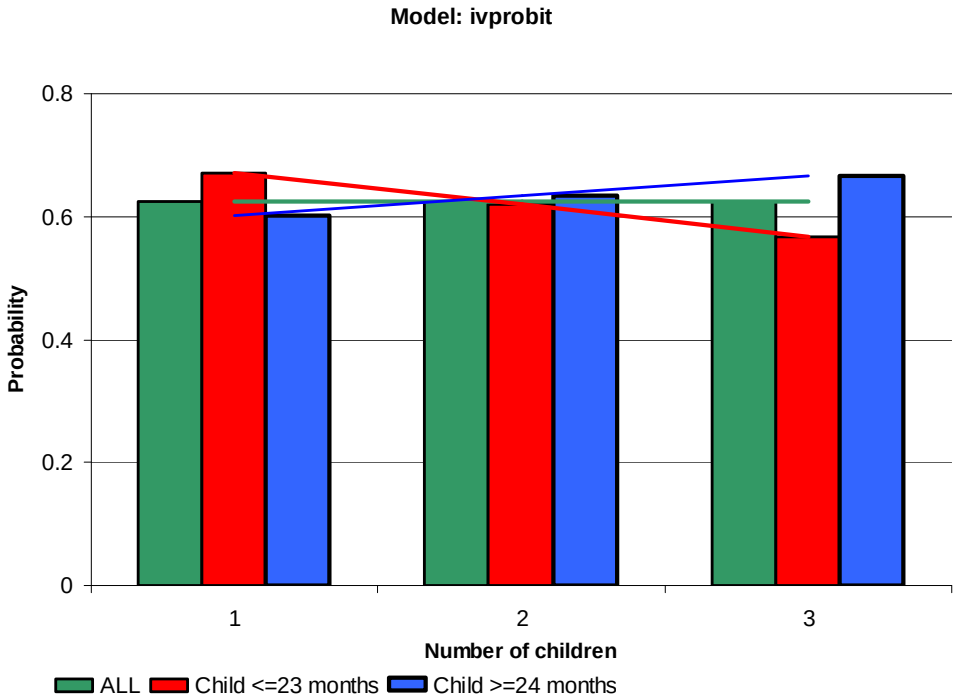
Figure 2: Predicted employment probabilities by parity and geographical area



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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