Abstract. Italy has been one of the first countries to reach the so called lowest-low fertility, i.e. below 1.3 children per woman, during the early 1990s. In this paper we assess the micro-level relevance of income for fertility decisions in Italy. So far, analyses have suffered from the lack of appropriate data. We make use of two different data sets: the Bank of Italy (SHIW) and ISTAT (Labor Force Survey) and apply discrete-time hazard regression techniques. For the first birth we find evidence of a non-proportional hazard and a recuperation effect: women with high predicted wages tend to delay the first birth but afterwards they recuperate. For the second and third birth, instead, the availability of a good child-care system seems to play a key role. Finally, we explore the possible effect on fertility of an increase in financial support for poorer families that took place in 1999.

Keywords: lowest-low fertility, income and childbearing, timing of births.
Introduction

In this paper we assess the effect of income on fertility in Italy during the period 1983-2003. This was a period in which Italian women have increased their educational attainment and labor force participation. At the same time, fertility levels declined significantly. In this setting it is of interest to establish to what extent women’s educational attainment, and therefore their opportunity cost, may affect their childbearing decisions. Given the limitation of available data we combine two different data sets. Data from the Labor Force Survey (ISTAT, 2003) are used in order to reconstruct the demographic characteristics and the fertility history of a woman. As a means to get a measure of the impact of income, we use income and earnings data from Bank of Italy (Households Income and Wealth, 2002) to predict women’s potential income levels, used as regressors in discrete time hazard regression models for first, second, and third birth. Our unit of analysis are women aged between 15 and 40 years in 2003, linked with their co-residing children at the moment of the interview. In order to obtain a measure of the income we use a Tobit model, censoring the augmented log-wage at the smallest value of the \( a \)-incremented log-income distribution. Our measure of predicted income is used in order to assess its impact on childbearing and timing of birth decisions. We are mainly interested in showing if income plays a key role in the postponement of motherhood in Italy and its different impact in the transition to first, second and third birth. More specifically, we assess if socioeconomic features are the only determinants in such a transition or if other socio-cultural situations are responsible for delaying motherhood and deciding whether to have the second and third birth.

The paper is organized in 4 sections: in section 1 we review the existing literature and focus on the Italian setting; section 2 provides a description of the data and methods used in order to estimate the transition to first, second and third birth; in section 3 we present our main results. Section 4 includes concluding remarks and policy considerations.

1 Background

1.1 Previous Literature

Becker (1960) underlines that fertility decisions can be analyzed within an economic framework and concludes that there is a positive correlation between the number of children and the household income, after controlling for contraceptive knowledge. This implies that the highly educated (potential) mothers tend to substitute the number of children with quality of children. That is, her education has a strong negative effect on the quantity of children and a strong positive effect on
their quality (see Becker and Lewis, 1973). What is clear in these previous studies is the endogeneity of labor and fertility. Per capita income is endogenous because of the strong relation with human capital which in turn is used as a proxy for education. Fertility is endogenous because of the substitution effect which is the main channel through which income affects fertility, i.e. both production and rearing of children are time intensive so an increase in wage rates induce a strong negative substitution effect on the demand for children (see for instance Mincer 1963, Becker 1965). To this extent, theoretical research on fertility (like Becker 1981; Willis 1974; Hotz et al.1997) shows that women’s income is negatively associated with childbearing as a higher income increases her opportunity cost of children. In other words, when she has high earnings, it becomes more expensive for her to take time away from work to rear children (compared to someone with low income). The economics literature also suggest that there would be an opposing income effect(i.e. higher income implies more money to spend), but the literature generally suggests that the price effect (i.e. the opportunity cost) dominates the positive income effect. In this way the expected effect from female wages is negative since her time use is extracted away from the market earnings and spent on bearing and caring children. The effect of men’s earnings is different: the income effect tends to dominate since they spend less time on rearing children (i.e. the higher income of the husband increases fertility). Though the magnitude of these effects will vary across countries and birth parity (Butz and Ward 1979; Willis 1973 are an example).

Ermisch (1989) offers an extension to this setting. The main idea is that the effect of women’s income depends on the availability of external childcare. Suppose there is external childcare available but there is a costs associated with it. Then, those women with very high earnings, traditionally having a high negative opportunity cost of childbearing, may in fact have more children, because they are more able to afford external childcare. Those with very low income or wages cannot afford external childcare, but since they have low earnings they also have low opportunity cost and they may therefore leave the labor market to have children. In this scenario both low and high income women will have more children, whereas those with middle income will have lower fertility (i.e. lower demand for children). The result depends of course on whether there is good availability of childcare: we might expect such effects in Scandinavian countries, whereas in Italy we may expect to see more of the traditional pattern.

During the last two decades, however, research has shifted towards investigating the timing of births rather than completed fertility (see for instance Heckman and Walker 1990). In these studies, hazard rate models are used in order to analyze the timing and spacing of birth. Most of the empirical studies about fertility dynamics show that women with high wages (i.e. high opportunity cost of having children) have births later in their life when compared to women with lower
opportunity costs. Furthermore, the female labor supply literature provides empirical evidence that the presence of children has a significant negative impact on the female employment probability (see Heckman and Macurdy 1980; Mroz 1987). As a consequence, we cannot take into account female employment and fertility decisions separately.

The decision problem about entry into parenthood cannot be solved only in terms of now or not (i.e. having/not having children), but has to be formulated by also considering the now or later, that is a couple pay special attention to the cost of having a child now, compared to those they would face if they had child later. In such a way, the optimal age of having the first birth is a trade-off between investment in human capital and career planning (see Gustafsson, 2001). As emphasized by Cigno and Ermisch (1989), Cigno (1991, chapter 8) and Gustafsson and Wetzels (2000), it is important to study the consequences for lifetime earnings of different timing of first birth. For a woman it may be optimal to delay motherhood until her opportunity cost of childcare in terms of her career have decreased, leading her to first complete her education and then establish herself in the job market. Formally, timing of first birth is a function of the opportunity cost of time (i.e. wage times periods not worked in the labor market due to childcare) and the foregone human capital cost (i.e. human capital investment foregone times the foregone returns to human capital investment due to child’s presence); consequently optimal timing maximize the opportunity cost plus the capital cost (Cigno, 1991, Chapter 8; Gustafsson 2001).

However, the effect of income on the timing of birth works through different paths. Gustafsson (2005) suggests that, for Swedish young people, the postponement of formal education works by delaying couple formation rather than by delaying parenthood once the couple is formed. So, family policies do have a pro-natalist effect in allowing Swedish couple to have the first child earlier. A different interpretation is offered by Amudeno-Dorantes et al. (2005) asserting that college-educated mothers can profit from delaying motherhood, because they are in a position to negotiate a family-friendly work environment with flexible work schedules.

A vast majority of the existing literature about the relationship between childbearing and the job market argues how women responsibility for child-rearing reduces her time in paid work and the rate at which such time is rewarded. Joshi (1990), for instance, analyze how patterns can be different (in terms of changing from full time to part time work or not employed) when comparing a mother with a childless one. However, the causal effect is explained in terms of the impact of the children presence on the women job market and their level of income. The main concern of this paper is to investigate the inverse causal effect that from the level on income moves to the determinants of the number of children each women is having during her life.
1.2 The Italian setting

In this paper we analyze how income may affect motherhood decisions in Italy. Figure 1 shows a clear path of increasing percentage of female having completed at least upper secondary school and labor force participation together with the evident decreasing pattern of total fertility during the 90’s.

Figure 1: EUROSTAT, Education, Fertility and female participation rates

Notes: Fertility rates: 1998 and 1999 are provisional values and 2000, 2001, 2002 are estimated values. Education is the percentage of the female population aged 20 to 24 having completed at least upper secondary education. The female employment rate is calculated by dividing the number of women aged 15 to 64 in employment by the total female population of the same age group.

At the same time, mean age of the first birth has increased over time: according to the Council of Europe (2001), *Recent Demographic Developments in Europe*, it was 25 years in 1980, 26.9 in 1990, reaching the level of 28.0 in 1995 and 28.7 in 1997. As Kohler, Billari and Ortega (2002) point out Italy has been, together with Spain, the first country to reach the threshold of so-called lowest-low fertility, i.e. below 1.3 children per woman during the early 1990s. Our aim is to investigate
if it is possible to infer that income and the increasing presence of women in labor market can be a valid justification for the lowest-low fertility. de la Rica et al. (2005) show that the decision whether to get married for Spanish men is strongly and negatively correlated with unstable job contracts or not working. However, for women the presence of a fixed-term contract does not play a key role in the decision whether to get married compared to the effect it exerts in delaying motherhood. The authors assert that the presence of an insecure labor market may be one of the reason for the fact that the Spain has one of the oldest mother among European countries. For the Italian case, however, there is a lack about the effect that socio-economic variables play on the timing of birth.

It is now well known that the emergence of the lowest-low fertility in Southern of Europe is not connected to any rise in childlessness (Billari and Kohler, 2004). To be more specific, available parity-specific data on fertility show that most of the fertility decline has been observed in Italy during the last twenty years is due to the sudden decrease of the progression to the third and forth child. As a consequence, the probability to have a first child has not changed in spite of the tremendous economic and social changes characterizing Italy during the second half of the 20th century (see Dalla Zuanna, 2004). In particular we argue that economic factors play a key role in determining the transition to parities higher than the first. In a recent survey (2002) on a sample of mothers aged around 42, living in five Italian cities, women gave reasons for why they had stopped at the parity they actually experienced. Concerning the transition to the third birth (i.e. women who stopped at two children), economic reasons where cited as important for women who experienced a worsening of their financial situation after the birth of the fist and second child. Women argue that monetary transfers for the first three years after the birth of a third child, or a lower but longer financial incentive could have changed their decision to stop at parity two (De Santis and Breschi, 2003). Although being possibly biased as any ex-post motivation, this role of economic factors is specific for third birth. In such a way, it is reasonable to suppose that increasing financial support to households with children may have an impact on the probability of having the third and fourth child, mainly for poorer households. To this extent, Turco’s law (law number 448 of the Year 1998) introduced two policy measures with the explicit purpose of supporting poor households with children. The measures of the law were introduced in 1999. The first measure provided, starting from 1999, a cash transfer of around 110 Euros per month for households with at least three children under 18 who had low household income levels (i.e. less than 15,000 Euros a year before taxation). This amount grew slowly year on year, following the life-cost index and it reached around 120 Euro a month in 2001. The share of households receiving this transfer has been particularly sizeable for larger households, especially in Southern Italy. About 300 million Euros were transferred in total in 1999 and 2000. The second measure had relatively
mild restriction on income levels and it provided a monetary transfer to households in which one of the partners (typically woman) was not employed. The transfer, for a period of 5 months, was a monthly amount of 100 Euros in 1999, 155 in 2000, 260 Euros in 2001 and 2002. An important share of women received this transfer, especially in South. The two measures could also be simultaneously received, in an additive way. They were introduced for the anti-poverty purpose of assisting families with many children, who are at risk of being poor; they were not introduced as pro-natalist measures, but could be implicitly pronatalist (Whittington et al., 1990). Indeed, this two measures could cause a significant increase of households income for low-income households, covering a non-negligible proportion of the cost of an additional child.

2 Data and Methods

Micro evidence on the relationship between the timing and the spacing of birth has been scarce for the Italian case, mostly because of the absence of wage and income data linked with fertility histories. The data requirement for estimating the impact of income on the timing of birth is demanding: we need panel data with a large dimension or retrospective data on the complete female employment and fertility histories. Usually, and this is our case, a researcher has available only cross section data or panel data with a short time dimension. Fertility histories may be reconstructed on the basis of the age of the children in the house but the complete labor market history of the women in the household will be more difficult or even impossible to reconstruct. This is because one observe for each household the number of children present and the employment status of the women in the household only at the time of the interview.

Unfortunately none of the currently available data sets in Italy contains all the information relevant to our analysis. On one hand, the Bank of Italy’s SHIW (Survey of Italian Households’ Income and Wealth) contains detailed information on the employment and income of the family members, labor market activities, payment instruments and forms of savings, socio-demographic characteristics of the household but the sample size is too small (even when we try to construct the panel from the same survey). On the other hand, the Labor Force Survey, collected by the Italian Institute for Statistics in 2003, provides detailed information on the family structure, labor market, work experience, part time and full time employment. The main drawback of this survey is that it does not collect information on household earnings and income even if the sample size is sufficiently large for our analysis.

In order to overcome these limits, we merged the above two data sets by computing a regression model in the Bank of Italy data set and then using the coef-
coefficients to predict estimates of the variable for the ISTAT one. In this way, data fusion provides a means of combining information from different source into a single data set.

2.1 Bank of Italy’s SHIW

The Survey of Italian Households’ income and Wealth started during the 1960’s and its main aim was to collect information about income and savings of the Italian households. During the past few years, however, new questions about payment instruments and forms of savings have been introduced. In this work we refer to 2002 survey, because the 2004 survey data is not yet released.

The survey collects information on more than 22,100 individuals (8,011 households) with 13,536 individuals receiving an income.

Our unit of analysis is the woman. We only consider households where it is possible to link each woman with their co-residing children. We exclude households where there is some other children but we are not able to understand to which female living in the house these children belong to. In total we have 20,003 individuals.

In our second step, we link each individual with their income: from the survey we have information about of the activity of the employees (their total net income, average worked number of hours, hours of paid overtime), about the members of the professions, sole proprietors and free-lances, contingent worker employed on none account (if they worked all year or only for part of the year, their net earnings and average worked number of hours), about the family businesses, active shareholder/partner, pensioners and other income such as scholarship, alimony etc. Every individual now has an income (or a zero income) and, if he does different activities, his income is the sum of all incomes. We end with a measure of the annual income and hourly one.

The third step is the linkage of data. As our unit of analysis is the female, every record is a female with her children, husband and other relatives linked with her.

2.2 Labor Force Survey

The Italian Labor Force Survey is a quarterly and continuous survey implemented by ISTAT (Italian National Institute of Statistics) since 1959. During each year, until 2003, 4 waves are carried out. The survey collects information on more than 300,000 households (about 800,000 individuals, i.e. 1.4 per cent of total national population) distributed in 1,351 over 8,000 Italian municipalities. Labor force survey is the principal statistical source on the Italian job market. The sample design is a two stage rotating sample design with stratification of the primary units
(municipalities, the secondary units are the households). The sample scheme is $2 \times 2 \times 2$: that is each household is in for two waves, two waves out and two in again, so after each wave the 25 percent of the sample is renowned.

The Survey offers different sections dealing with demographic characteristics of the households, present job (with all the information taken from the month before the interview), job experience, looking for a job, relationship with public employment centers. But this survey is designed in order to study the relevant features of the Italian job market: as a consequence, there are no questions about the number of children of the women and we only know with certainty the mother of children living in the house when the female is the head of the household or the spouse of the head of the household.

The way we used to link every child to his or her mother was a method called Own-Children Method, that is every woman has been linked with their co-residing children at the moment of the interview and thus it include some adopted children or stepchildren and exclude any offspring who may have died or moved away. As in Italy mortality at adult age is low, children of the relatively rare divorced parents are almost exclusively living with their mothers and a very low proportion of people leave the parental family before 23. The only constraint we impose is that we consider women who are 40 or less in 2003: having reconstructed the variable children with the own-children method, it can happen that we do not see certain children because they had already left home at the moment of the interview. Furthermore, as the unit of analysis is the female, we dropped all the households where we were unable to link children with mothers (i.e. male head of the household with no wife) and all single men. In this way we ended with 34914 observations (i.e. females).

### 2.3 Methods

The strategy we followed can be summarized in 4 steps: first we estimate a wage equation using the Bank of Italy data set, second we append this data set to the ISTAT one and use the estimated coefficient of the SHIW’ in order to predict an income for the selected female belonging to the Labor Force Survey, thirdly we create three data sets with females being at risk of the first, second and third child and finally we investigate if the introduction of Turco’s law in 1999 has had an impact on the risk of having the third birth.

The problem of how to specify a wage equation in explained in Appendix A. Our aim is to estimate the impact of predicted income $\hat{\omega}_i$ on fertility using a discrete time event model. Consider a series of $P$ predictors $X_{1ij}, X_{2ij}, \ldots, X_{Pij}$ and let $x_{pij}$ denote individual $i$’s values for the $p$th predictor in time $j$. The hazard
function is defined like:

\[ h(t_{ij}) = Pr[T_i = j | T_i \geq j \text{ and } X_{1ij} = x_{1ij}, X_{2ij} = x_{2ij}, \ldots, X_{Pij} = x_{Pij}] \]

that is, the population value of discrete-time hazard for person \( i \) in time period \( j \) is the probability that he or she will experience the target event in that time period, conditional on no prior event occurrence and his or her particular values for the \( P \) predictors in that time period (see for example Jenkins, 1995).

We are going to estimate a variety of models and the specified baseline will be different if we are studying the first, second or third birth. So:

- **Baseline for the model of the first birth is:**

  \[ \text{logit}(h_{ij}) = \left[ \alpha_1 A_{i1} + \ldots + \alpha_{40} A_{i40} \right] \]

  where \( A_{ih}, h = 15, \ldots, 40 \) are dummy variables indicating a non-parametric specification of time and

  \[ A_{ih} = \begin{cases} 
  1 & \text{if } i\text{th woman is } h\text{-years old} \\
  0 & \text{Otherwise} 
  \end{cases} \]

- **Baseline for the model of the second birth is:**

  \[ \text{logit}(h_{ij}) = \left[ \beta_1 D_{i1} + \ldots + \beta_{25} D_{i25} \right] \]

  where \( D_{ik}, k = 1, 2, \ldots, 25 \)

  \[ D_{ik} = \begin{cases} 
  1 & \text{if } i\text{th woman is observed after } k\text{-years from the birth of the first child} \\
  0 & \text{Otherwise} 
  \end{cases} \]

  so that \( D_{ik} \) is a function of the spell, duration, from the first birth. (The baseline is similarly specified for the third birth).

In order to assess the impact of income of fertility different specification of the model are offered:

- **General Income Effect**

  \[ \text{logit}(h_{ij}) = \left[ \delta_1 P_{i1} + \ldots + \delta_{ij} P_{ij} \right] + \pi_1 \hat{\omega}_i + \pi_2 \hat{\omega}_i^2 \]

  where

  \[ P_{ig} = \begin{cases} 
  A_{ih} & \text{if first birth is under study} \\
  D_{ik} & \text{if second/third birth is under study} 
  \end{cases} \]

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• *Income Effect and Duration Effect*

\[
\text{logit}(h_{ij}) = \left[ \delta_1 P_{i1} + \ldots + \delta_J P_{iJ} \right] + \pi_1 (\hat{\omega}_i * P_{i1}) + \pi_2 (\hat{\omega}_i * P_{i2}) + \ldots + \pi_J (\hat{\omega}_i * P_{iJ}) + \gamma H_i
\]

and

\[
H_i = \begin{cases} 
0 & \text{if first birth is under study} \\
\text{age first child}_i & \text{if } i\text{th woman is at risk of second birth} \\
\text{age second child}_i & \text{if } i\text{th woman is at risk of third child}
\end{cases}
\]

and (age first child)\(_i\) is the age at which the woman had the first child (a woman is at risk of the second child since she had the first one).

• *Institutional/Cultural Effect*

\[
\text{logit}(h_{ij}) = \left[ \delta_1 P_{i1} + \ldots + \delta_J P_{iJ} \right] + \pi (\hat{\omega}_i * \sum_{k \in \{S,N,C\}} d_{ik}) + \tau (\sum_{k \in \{S,N,C\}} d_{ik}) + \gamma H_i
\]

where \(k \in \{\text{South, Centre, North}\}\) and

\[
d_{ik} = \begin{cases} 
1 & \text{if } i\text{th woman lives in the } k\text{th region} \\
0 & \text{Otherwise}
\end{cases}
\]

• *Turco’s Law (1999)*

\[
\text{logit}(h_{ij}) = \tau (\sum_{k \in \{S,N,C\}} d_{ik}) + N_i + (\hat{\omega}_i * F_i) + F_i * N_i
\]

where \(j = 1983, \ldots, 2003\) and

\[
F_i = \begin{cases} 
1 & \text{if } i\text{th is poor} \\
0 & \text{not poor}
\end{cases}
\]

\[
N_i = \begin{cases} 
1 & \text{if } j \geq 1999 \\
0 & \text{if } j < 1999
\end{cases}
\]
3 Results

In this section we present how income may affect the risk of having the first, second and third birth. We conclude including the empirical evidence linked with Turco’s Law.

**FIRST BIRTH**

The baseline for the first birth is an inverse U-shape, exhibiting a maxima when women is 30-31 years, when controlling only for income and income squared. This effect seems overestimating the mean age of Italian mother at the first birth: in 1997, for example, the average female age at first birth mother for the first time was 28.7 (See Council of Europe (2001), *Recent Demographic Developments in Europe*). As showed in figure 2, the mean average age for the first birth is pushed down when we add interaction between age and income. In such a way we can see that there is an anticipation effect that shifts the average age of first birth between 27 and 29 years.

![Figure 2: Baseline for the First Birth](image)

**Notes:** Women between 15 and 18 are the reference group.

The general income effect for the first child is negative (-0.407): the higher the income, the less is the risk of entering into motherhood. However, this happens
at increasing rate because the coefficient associated with income to the power of two is positive (0.070). The general income effect has been approximated by a second order polynomial (a parabola), with a positive squared coefficient (a convex function) and negative first order coefficient. This means that until the income reaches its minimum, i.e. 2,907 (0.407/2*0.070), every additional unit of income has a decreasing impact on the risk of the first birth, after this level has been passed by income is positively correlated with motherhood.

In table 1 we report the estimated coefficients for women being at risk of the first birth where income has been stratified by age and has been interacted with region: this allows us to understand how income impacts on first birth after controlling for age and cultural/institutional effects.

Table 1: Discrete-time logit hazard regression: Income and First Birth

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coeff. (S.E.)</th>
<th>Coeff. (S.E.)</th>
<th>Coeff. (S.E.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Income Effect:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>-0.407**</td>
<td>(0.007)</td>
<td></td>
</tr>
<tr>
<td>(Income)$^2$</td>
<td>0.070**</td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td><strong>Income and age:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inc.$\times$ age (15-17)</td>
<td>-0.770**</td>
<td>(0.067)</td>
<td>-0.698**</td>
</tr>
<tr>
<td>Inc.$\times$ age (18-20)</td>
<td>-0.508**</td>
<td>(0.022)</td>
<td>-0.436**</td>
</tr>
<tr>
<td>Inc.$\times$ age (21-23)</td>
<td>-0.620**</td>
<td>(0.015)</td>
<td>-0.540**</td>
</tr>
<tr>
<td>Inc.$\times$ age (24-26)</td>
<td>-0.494**</td>
<td>(0.014)</td>
<td>-0.409**</td>
</tr>
<tr>
<td>Inc.$\times$ age (27-29)</td>
<td>-0.330**</td>
<td>(0.015)</td>
<td>-0.244**</td>
</tr>
<tr>
<td>Inc.$\times$ age (30-31)</td>
<td>-0.104**</td>
<td>(0.021)</td>
<td>-0.021</td>
</tr>
<tr>
<td>Inc.$\times$ age (32-33)</td>
<td>-0.064*</td>
<td>(0.027)</td>
<td>0.018</td>
</tr>
<tr>
<td>Inc.$\times$ age (34-35)</td>
<td>0.070†</td>
<td>(0.037)</td>
<td>0.152**</td>
</tr>
<tr>
<td>Inc.$\times$ age (36-40)</td>
<td>0.121*</td>
<td>(0.048)</td>
<td>0.206**</td>
</tr>
<tr>
<td><strong>Region effect:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center</td>
<td>-0.244**</td>
<td>(0.022)</td>
<td></td>
</tr>
<tr>
<td>North</td>
<td>-0.191**</td>
<td>(0.020)</td>
<td></td>
</tr>
<tr>
<td><strong>Income and region:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income$\times$ center</td>
<td>-0.008</td>
<td>(0.019)</td>
<td></td>
</tr>
<tr>
<td>Income$\times$ north</td>
<td>-0.058**</td>
<td>(0.017)</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-6.167</td>
<td>(0.057)</td>
<td>-6.561**</td>
</tr>
</tbody>
</table>

Notes: †p<0.01; *p<0.005; **p<0.001.
Ref. group for Region is South.
Baseline not reported

In order to understand how different level of income affects the timing of first birth, we simulate the path for a low and high income woman. A low income
female is a woman having an hourly wage equal to the 10th percentile of the income distribution (so that high income means wage coincident with the 90th percentile of the distribution). Figure 3 shows a non-proportional hazard and a recuperation effect: women with high income starts their motherhood later, but afterwards they tent to recuperate, while poor female starts in advance.

Figure 3: Timing of first birth for a low and high income woman

Notes: Low income=-1.73; High Income=1.62.

We find that higher wages have their primary effect on postponement of first birth so that when wages are higher, pregnancy tends to be concentrated in a shorter span of the life cycle that starts later in life. This is in line with the opportunity cost theory (see Heckman and Walker, 1990): fewer employed wives would quit their job to have children if an exit from the labor market could seriously damage their future labor market prospects (Boix, 1997). This effect would be more important the greater the uncertainty in the labor market or the higher the unemployment rate. This is one of the reason why Center and North regions exhibits negative estimated coefficient for the risk of the first birth when compared to the South (where there is higher uncertainty related to the finding of a job and labor market conditions). Furthermore, there is another aspect to be mentioned: recruitment policies of firms reinforce the postponement incentives (Gustafsson,
2001), since they often recruit young talents and it is less common to recruit a person in the post-parental phase into a position involving a long period of training. So, a possible explanation of the negative coefficients related to the interaction between income and region is the huge presence of public jobs in the South where working women are mostly employed in teaching or administrative activities because of the scarce presence of firms. Female working in public sectors have indefinite contracts and pre/post maternal paid period, in this way once they have reached that position they do not have instability (i.e. firing) problems. Moving from the south to the north, the style of life changes and we also find a change in the prevalent position with private activities being preferred to the public one. To this extent a Northern woman with high wage is forced to postpone her motherhood until she reaches a certain position in their career planning, because of the depreciation of woman’s human capital at work during her temporary absence from the labor force for childbearing. Another argument in favor of the negative interaction between income and region is that, presumably, mothers with higher career prospects decide to postpone maternity until they get a more stable market situation, i.e. until they get an indefinite contract (see de la Rica et al, 2005 for an explanation for the Spanish case). However, in our data, we are not able to reconstruct the job position of a female, mostly because of the lack of information on her position before 2003. Any way, it seems there is no institutional/cultural effect involving the decision of when give the first birth.

SECOND AND THIRD BIRTH
A different pattern is showed by females at risk of second and third birth. A female is at risk of second birth if she has already had one birth and she is at risk of third birth only if she has already experienced two previous births. A trivial consequence of this obvious fact is that the age of a woman at the time she becomes at risk may affect second (and third) birth fertility (see Heckman et al, 1990). Our estimates in table 2 proves that the more the age of first birth is delayed, the less is the risk of second birth (-0.014); not only, but the coefficient we get for the age of second birth is smaller than the previous one, meaning that the risk of having a third child is strongly and negatively correlated with the age at which second birth was given. So, mothers who tend to delay first birth are less at risk of having a second birth and those who delay the second one usually do not have the third one, in the end. Also in this case income has a negative effect on fertility at decreasing rate: the main difference is that while the income effect for second birth is negative and significative, the coefficient for the third birth is near zero and not significative. This means that the income effect plays a marginal role in third birth and this result is clear and evident in Italy where a growing number of families have only one child.

Looking more specifically at how income may affect transition to second and
Table 2: Discrete-time logit hazard regression: General Income Effect for second and third birth

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient (Std. Err.)</th>
<th>Coefficient (Std. Err.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transition to second birth</td>
<td>Transition to third birth</td>
</tr>
<tr>
<td><strong>General Income Effect:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>-0.073** (0.009)</td>
<td>-0.0004 (0.020)</td>
</tr>
<tr>
<td>(Income)^2</td>
<td>0.066** (0.005)</td>
<td>0.099** (0.012)</td>
</tr>
<tr>
<td>Age at first birth</td>
<td>-0.014** (0.003)</td>
<td></td>
</tr>
<tr>
<td>Age at second birth</td>
<td></td>
<td>-0.102** (0.006)</td>
</tr>
<tr>
<td>Intercept</td>
<td>-3.615** (0.078)</td>
<td>-2.166** (0.193)</td>
</tr>
</tbody>
</table>

third birth reported in table 3, we find coefficients for age at first and second birth of the same intensity we had in table 2 after controlling for income and interaction with duration, region effect and institutional effect. Income plays a negative role in influencing the probability of second birth one/two years after the first birth. This is either because households prefers to spend any additional unit of income for the first birth or because it is the moment woman re-enter in the labor market. So, even if her income increases, she has no incentive to use it for rearing a new child. Different is the situation after 3/4 years the birth of the first child: in this case an increase in income has a positive effect on second birth. Similar pattern is followed by women at risk of third birth: income effect is negative when the spell from second birth is very short and it becomes positive (even if not significative) 3/4 years after the second birth. This suggests that the timing for second and third birth, for the Italian case, is positively induced by socioeconomic variables only 3/4 years after having experienced previous birth. Afterwards, the risk of giving a new birth decreases as we move away from the date of the preceding birth. This is perfectly in line with Heckman et al (1990) point of view about the 3th birth in Sweden, i.e. when wages are higher there is a primary effect in reducing third birth and a secondary effect that forces pregnancy to be concentrated in a shorter length of life cycle (that starts later).

Furthermore, table 3 shows that people living in the Center and North are less likely to experience a second/third birth when compared to the South. But this is not all. Table 3 reveals a clear institutional/cultural effect underlined by the interaction income and region. An additional unit of income for a Northern female increases her risk to have a second/ third birth. We can argue that this exhibits the confidence in the Child-Care system by working mothers living in the North and Center (see del Boca et al, 2005 for a complete explanation). In Southern Italy, there are no crèches, for example, and working mothers tend to prefer informal child care, i.e. baby-sitter and grandmothers living nearby and in good heath condition. But when one of these two conditions is not satisfied, have
Table 3: Discrete-time logit hazard regression: Income and Region effect for second and third birth

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient (Std. Err.)</th>
<th>Coefficient (Std. Err.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transition to second birth</td>
<td>Transition to third birth</td>
</tr>
<tr>
<td>Age at first birth</td>
<td>-0.031** (0.003)</td>
<td>-0.116** (0.007)</td>
</tr>
<tr>
<td>Age at second birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Income and duration:</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inc. × dur (1/2)</td>
<td>-0.046† (0.026)</td>
<td>-0.015 (0.058)</td>
</tr>
<tr>
<td>Inc. × dur (3/4)</td>
<td>0.069** (0.017)</td>
<td>0.051 (0.040)</td>
</tr>
<tr>
<td>Inc. × dur (5/6)</td>
<td>-0.064** (0.019)</td>
<td>-0.028 (0.044)</td>
</tr>
<tr>
<td>Inc. × dur (7/9)</td>
<td>-0.150** (0.024)</td>
<td>-0.097* (0.046)</td>
</tr>
<tr>
<td>Inc. × dur (10/13)</td>
<td>-0.168** (0.044)</td>
<td></td>
</tr>
<tr>
<td>Inc. × dur (10/14)</td>
<td></td>
<td>-0.328** (0.064)</td>
</tr>
<tr>
<td>Inc. × dur (14/25)</td>
<td>0.130 (0.092)</td>
<td>-0.273 (0.219)</td>
</tr>
<tr>
<td>Inc. × dur (15/24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Region effects:</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center</td>
<td>-0.432** (0.031)</td>
<td>-0.304** (0.074)</td>
</tr>
<tr>
<td>North</td>
<td>-0.489** (0.026)</td>
<td>-0.248** (0.065)</td>
</tr>
<tr>
<td><em>Income and Region:</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income × Center</td>
<td>0.008 (0.029)</td>
<td>0.110 (0.078)</td>
</tr>
<tr>
<td>Income × North</td>
<td>0.225** (0.022)</td>
<td>0.274** (0.054)</td>
</tr>
<tr>
<td>Intercept</td>
<td>-2.842 (0.084)</td>
<td>-1.552** (0.205)</td>
</tr>
</tbody>
</table>

*Notes:* †p<0.01; *p<0.005; **p<0.001

*Ref. group for region: South.*

*Dur (1/2)= See section about Methods.*
another child means additional costs in terms of looking for somebody taking care for the child. So, the decision of a second/third birth, even if in presence of additional unit of income, is not straightforward. Different is the situation in the North, where the big presence of public and private services offers, at least in theory, a child-care system able to look after children even if very young.

**TURCO’S LAW (1999)**

As we point out in the theoretical background, Italy has been one of the first Country to reach the so-called Lowest-low fertility during the early 1990 (Kohler et al., 2002). Several researchers have focussed on the existence of an unmet need at the national level for family-friendly policies as one of the reason behind lowest low fertility (see for example Demeny, 2003). Nevertheless, so far we have had no scientific evidence on the impact of policies that may affect fertility when it reaches lowest-low levels. Moreover, there seems to be a general skepticism in the literature concerning the issue of whether public policies may have an impact on choices concerning fertility. Table 4 considers only females being at risk of third birth studied in a neighbor of the threshold (1997-2001): even if we started with a huge data set we end with 44,853 records in person-year formats.

Table 4: Discrete-time logit hazard regression: Assessing the impact of Turco’s Law

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>(Std. Err.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South</td>
<td>0.005</td>
<td>(0.075)</td>
</tr>
<tr>
<td>Center</td>
<td>-0.353**</td>
<td>(0.105)</td>
</tr>
<tr>
<td>General trend:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After 1999°</td>
<td>-0.054</td>
<td>(0.075)</td>
</tr>
<tr>
<td>Poor after the law:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor after 1999°</td>
<td>0.052</td>
<td>(0.131)</td>
</tr>
<tr>
<td>Income × poor</td>
<td>0.391**</td>
<td>(0.113)</td>
</tr>
<tr>
<td>Intercept</td>
<td>-4.774**</td>
<td>(0.118)</td>
</tr>
</tbody>
</table>

Notes: $^\dagger p<0.01; ^* p<0.005; ^{**} p<0.001$

Ref. group for region: North.

$^\circ$ Ref. gr. poor before 1999

$^\circ$ Ref. gr. general trend before 1999

Basicallly, females living in the South are more at risk of third birth when compared to the Norther one. After the introduction of the law, the general period effect is negative confirming the lowest-low fertility for Italy and the difficulty in the transition to the third birth. However, if we restrict the attention to the
sub-group of poorer females, this shows that after 1999 they are more at risk of having a third birth when compared to the sub-group of poor females before the introduction of the law. Not only, but every additional unit of income for a poor females increases the probability of the third child. This presents an effect of the Law, even if it is not statistically significant. In this case, we agree with Gauthier (2001) who stated that "Overall, thus, the multivariate studies provide mixed conclusions as to the effect of policies on demographic and economic behavior, once other factors such as education, income etc. are controlled for. The effect, if any, tends to be small. Methodological issues may be at the basis of these inconclusive findings..." (see also Gauthier, 2004). We can argue that the Law had an impact, but we are not able to estimate exactly the intensity of this influence in increasing the number of third birth in Italy. The main difficulty is related to the availability of the data: in order to assess this kind of causal effect we need to use another methodological issue, i.e. Regression Discontinuity that identifies the impact of the policy measure with the shift in the regression line before and after the law is introduced. The main problem related to this kind of approach is that our instrument (the income) that discriminates between treated (who received the money) and not treated is estimated and we are not able to clearly identify the group of compliers (see Hahn et al., 2002 for an explanation). This is because we need to identify the impact of the law on income, that is how income of a poor household changed after receiving the benefit from the State. However, in the final version of the paper we would attempt to estimate a trend line before and after the law and explore in a more detailed way the causal effect induced by the Public Policy.

4 Conclusion

The aim of this paper is to find an empirical connection between the striking increase in the female labor participation and the delay in motherhood and the transition to second and third birth in Italy. Using two different data sets (one from the ISTAT Labor Force Survey, 2003, and the other from the analysis of the Households Income and Wealth led by the Bank of Italy in 2002), we estimate empirically the effect of income in the postponement of motherhood. We use two steps: we firstly estimate a wage equation including detailed controls for women’s educational attainment using a Tobit model. Secondary, we use this predicted income as a regressor in discrete time hazard models for the transition to first, second and third birth. Basically, we find that the income effect is negatively correlated with having children; the intensity, however, varies according to the order of birth we are considering. Income has a strong negative effect in the timing of first birth: as the cost opportunity theory suggests women with higher income tend to delay motherhood. Our estimates suggests a non-proportional hazard and a recuperation
effect: women with higher income starts having children later, but afterwards they recuperate, while poor females starts early. Furthermore, there is no evidence that institutional/cultural effects are responsible for the postponement of maternity.

Different is the pattern for second and third birth: income effect is always negative, but it has small intensity with respect to the first birth. Not only, but the coefficient for third birth is near zero, confirming that a growing number of Italian households have only one child. Nevertheless, we find an evidence of the role played by institutional aspects in the decision of having more than one birth. The empirical evidence for birth of order two and three is in line with Ermisch (1989) proving that the effect of women’s income depends on the availability of external care. More specifically, an additional unit of income for a Northern female increase the risk of experiencing a second an third birth because they are confident in the good availability of the childcare system.

We conclude focussing on a public policy implemented in Italy in 1999 (Turco’s law) and supporting, with monetary transfers, the incomes of poor households with children. Our estimates shows a trace of the effect of the law, not clearly identifiable and quantifiable caused by the methodology we are forced to use because of the data available. Despite this limitation our results provide an interesting evidence of the key role income plays in fertility decisions.

A Appendix

A wage equation is normally estimated (see for instance Mincer,1974) by an OLS regression where the dependent variable is the natural log of the reported wage. Typical variables to be included are age and age squared, education (either in terms of years of education or as a dummy variable reflecting the educational level), type of education, work experience, number of children, age of the children, ethnicity, region, profession. In theory we can estimate separate wage equations for men and women within the status of working person and pensioner. We do not care about pensioners: females are excluded because we limited our analysis to those who are 40 or less and male are not considered because of the established unit of analysis. Even if OLS is a standard strategy, there is one problem here. There will be any women who are recorded with zero wage simply because they do not work. The problem is that they might have chosen not to work because they would receive relatively low wage. In terms of the economic theory we say that they do not work because their offered wage is lower than their reservation wage (i.e. the lowest wage for which they would chose to work). So, if we choose those who work in our wage equation, we do have a selection problem. One standard solution for this problem is to estimate a participation equation using a probit model, but this approach might involve some other problems. In this case we esti-
mate a Tobit model (Tobin, 1958) which censors the distribution at selected (upper or lower) point: the female wage equation is left censored at zero.

Define:

\[
\begin{align*}
Y &: \text{ Hourly Observed Wage } \Rightarrow \min (Y)=0; \\
a &: \text{ Constant; } \\
W = Y + a &: \text{ a - augmented Wage } \Rightarrow \min (W)=a; \\
w = \log W &: \Rightarrow \min (w)= \log a.
\end{align*}
\]

We call \(Y_m\) the market wage and \(Y_r\) the reservation wage, so if \(Y_m \geq Y_r\) we observe the person as working and \(Y = Y_m\) and if \(Y_m \leq Y_r\) \(Y = 0\).

Consider the market wage and the reservation wage of person \(i\) specified as following:

\[
Y_{mi} = x_i' \beta + \epsilon_i
\]

and

\[
Y_{ri} = z_i' \gamma + \nu_i.
\]

The observed wage is given by:

\[
Y_i = \begin{cases} 
Y_{mi} & \text{if } Y_{mi} \geq Y_{ri} \\
0 & \text{Otherwise}
\end{cases}
\]

and so:

\[
Y_i = \begin{cases} 
x_i' \beta + \epsilon_i & \text{if } \epsilon_i - \nu_i \geq z_i' \gamma - x_i' \beta \\
0 & \text{Otherwise}
\end{cases}
\] (A.1)

We are interested in taking \(\log\) of A.1, but the logarithm of zero is \(-\infty\). Taking a constant \(a\) and assuming that \(W_i = Y_i + a\), we get:

\[
W_i = \begin{cases} 
a + x_i' \beta + \epsilon_i & \text{if } \epsilon_i - \nu_i \geq z_i' \gamma - x_i' \beta \\
\frac{a}{a} & \text{Otherwise}
\end{cases}
\]

with \(\min(W_i) = a\), so:

\[
w_i = \log(W_i) = \begin{cases} 
\log(a + x_i' \beta + \epsilon_i) & \text{if } \epsilon_i - \nu_i \geq z_i' \gamma - x_i' \beta \\
\log(a) & \text{Otherwise}
\end{cases}
\]

and \(\min(w_i) = \log a\).

Now, \(\log a\) is the lower bound for the log-wage distribution and it is the point of censure of the Tobit model. All the observations with augmented log income less
than \( \log a \) are censored. If we apply to this model a standard OLS, the estimates are biased and inconsistent.

If we call \( \hat{\omega}_i \) the log hourly predicted income, the wage equation we estimate is:

\[
\hat{\omega}_i = \hat{\beta}_0 + \hat{\beta}_1 \text{age}_i + \hat{\beta}_2 (\text{age})^2_i + \hat{\beta}_3 \sum_{j=1}^{8} \text{education}_{ij} + \hat{\beta}_4 \sum_{j=1}^{20} \text{region}_{ij}
\]

where \((\text{education})_{ij}\) are 8 dummy variables for different levels of education attained from the \(i\)th women and \((\text{region})_{ij}\) are 20 dummy variables, one for each of the Italian regions. Table 5 presents the estimated coefficient from an hourly wage equation for women (using Tobit).

The women selected sample in table 5 contains 4,749 females in the condition of being mothers, i.e. less than 45 years, not pensioners and not studying. Of these females 2,601 are censored by Tobit because they exhibit a zero income.

As we expected, the coefficient for age is positive and for age squared is negative: this is in line with the economic/econometric literature that income increase with age but at decreasing rate. Our results confirms the classical way to take education as a proxy of income: the more you study the more you earn. We can see that the coefficients associated with education go in the right direction: moving from lower level of education to higher level induces a gain in terms of hourly wage rates. We do not include position in the female wage equation because it is not provided the the Labor Force Survey. To be more precise, the ISTAT Survey asks women position only at the time of the interview and we are no able to reconstruct it back in 1983. The hourly wage does not exhibit a huge variability across different region of Italy, even if there is a clear tendency of lower hourly wage in the South (linked both with the presence of public job and the percentage of female not working) when compared to the North one.
Table 5: Hourly Female Wage Equation: Tobit

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>(Std. Err.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equation 1: model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>age</td>
<td>0.276**</td>
<td>(0.021)</td>
</tr>
<tr>
<td>(age)^2</td>
<td>-0.003**</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Middle School</td>
<td>0.530**</td>
<td>(0.092)</td>
</tr>
<tr>
<td>Professional Secondary School Diploma</td>
<td>1.246**</td>
<td>(0.137)</td>
</tr>
<tr>
<td>High School</td>
<td>1.541**</td>
<td>(0.096)</td>
</tr>
<tr>
<td>Short Course University Degree</td>
<td>2.118**</td>
<td>(0.301)</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>2.458**</td>
<td>(0.124)</td>
</tr>
<tr>
<td>Post-Graduate Qualification</td>
<td>3.375**</td>
<td>(0.772)</td>
</tr>
<tr>
<td>Piemonte</td>
<td>1.744**</td>
<td>(0.171)</td>
</tr>
<tr>
<td>Valle d’ Aosta</td>
<td>1.339*</td>
<td>(0.658)</td>
</tr>
<tr>
<td>Lombardia</td>
<td>1.477**</td>
<td>(0.165)</td>
</tr>
<tr>
<td>Trentino</td>
<td>2.099**</td>
<td>(0.258)</td>
</tr>
<tr>
<td>Veneto</td>
<td>1.321**</td>
<td>(0.181)</td>
</tr>
<tr>
<td>Friuli</td>
<td>1.553**</td>
<td>(0.229)</td>
</tr>
<tr>
<td>Liguria</td>
<td>1.675**</td>
<td>(0.196)</td>
</tr>
<tr>
<td>Emilia Romagna</td>
<td>1.881**</td>
<td>(0.170)</td>
</tr>
<tr>
<td>Toscana</td>
<td>1.608**</td>
<td>(0.181)</td>
</tr>
<tr>
<td>Umbria</td>
<td>1.782**</td>
<td>(0.208)</td>
</tr>
<tr>
<td>Marche</td>
<td>1.728**</td>
<td>(0.197)</td>
</tr>
<tr>
<td>Lazio</td>
<td>0.767**</td>
<td>(0.188)</td>
</tr>
<tr>
<td>Abruzzi</td>
<td>1.024**</td>
<td>(0.220)</td>
</tr>
<tr>
<td>Molise</td>
<td>0.967**</td>
<td>(0.320)</td>
</tr>
<tr>
<td>Campania</td>
<td>-0.143</td>
<td>(0.182)</td>
</tr>
<tr>
<td>Basilicata</td>
<td>1.466**</td>
<td>(0.325)</td>
</tr>
<tr>
<td>Calabria</td>
<td>1.107**</td>
<td>(0.230)</td>
</tr>
<tr>
<td>Sicilia</td>
<td>0.191</td>
<td>(0.179)</td>
</tr>
<tr>
<td>Sardegna</td>
<td>1.065**</td>
<td>(0.208)</td>
</tr>
<tr>
<td>Intercept</td>
<td>-7.157**</td>
<td>(0.509)</td>
</tr>
<tr>
<td>Equation 2: sigma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>1.715**</td>
<td>(0.030)</td>
</tr>
</tbody>
</table>

Notes: †p<0.01; *p<0.005; **p<0.001

Ref. group for education: none and elementary school.
Ref. group for regions: Puglia.
References


