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UNION FORMATION AND CHILDBEARING OF ITALIAN WOMEN

A LIPRO ANALYSIS ON ITALIAN FFS DATA[1]

Introduction

1. The overall level of fertility in Italy has dropped below the replacement level in the '80s; the value of the TFR is now 1.18, the mean age at first birth having reached 30 years (Istat, 1998).

2. Low fertility represents a problem whose scope and urgency can be analysed from different points of view. First of all, the effects of a decreasing TFR on the age-structure of the population[2] pose dramatic questions to the pension system, already on the edge of collapse. In a recent study Livi Bacci (1998) has calculated that it won't take longer than three decades before the amount of retired will exceed that of the employed in Italy, current natality trends holding constant.
Secondly, there is a more subtle issue at stake: the gap between reproductive ideals and intentions, on the one hand, and the effective behaviour, on the other is certainly a minor question, especially if one considers the high grade of instability and unreliability of the desired number of children, but still a significant one. Recent data (Sorvillo and Marsili, 1998) show that the average number of desired children is around the replacement level, confirming previous findings (De Sandre, 1982; Ciucci, 1988).

3. A fundamental issue commonly addressed when trying to assess the ultimate determinants of such a situation is the increasing delay in experiencing the transition to adulthood among young Italian men and women (De Sandre *et al*., 1997). Due to the rigidity of a social system in which the process of transition from living in the parental home towards moving out of it, starting a stable relationship and having children is highly *sequentialized*, the postponement of any of the steps involved in this process may result in further postponements and, in turn, affect fertility (Castiglioni and Dalla Zuanna, 1996). This can be easily understood if one bears in mind that the proportions of births out-of-wedlock have always been (and still are) very low in Italy and that the time-interval from union formation until first birth is increasing (Saraceno, 1998).

4. Young Italians stay in the parental home longer than any other Europeans (only Spanish exhibit similar trends): in 1991 two-thirds of male and female population aged 18-29 were reported to live with parents (Piccone Stella, 1997)[3]. Two main "models" are usually identified when charting the European

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[1] Prepared by Federico Geremei , based on the Master thesis: "Transizioni allo stato adulto e strategie riproduttive in Italia – *sensitivity* analisi per un sostegno alla fecondità tramite il modello LIPRO", Università degli Studi di Roma *La Sapienza*, 1998.

[2] The proportion of people over 65 years of age has doubled in Italy in the second half of the current century (from 8.2% to 16.4%), while children younger than 14 years now represent 15.1% of the total amount (26.2% only in 1951).

[3] Donati (1988) introduced the expression "prolonged family" for this peculiar Italian situation.

patterns: one for the northern and central nations and one for the southern ones. What distinguishes the latter is not only a higher mean age at leaving the parental home, but also a (reported) higher degree of independence and individual autonomy of the adolescents who live with their parents[4].

5. An intermediate phase/condition between *young* and *adult* is emerging (Cavalli and Galland, 1995): multiple patterns and timings of home leaving emerge together with new meanings of the in-between stages.

6. Because of this complexity, structural factors alone are not sufficiently explicative and a mixture of different causes, contexts and dimensions (social norms and values, economic factors and so on) has to be considered. Two main streams of explanations are usually followed: an economic on one side and a relational one on the other. As for the former, the young who keeps living with his/her parents rationally chooses to do so on the basis of the (perceived) advantage of staying home with respect to the real and potential difficulties (both immediate and future) that moving out imply[5]. As for the latter, when young people do not leave the parental home early, this might be not only because it is more convenient for them, but also because parents do not push them to leave. Many scholars have pointed out that a re-definition of the inter-generational relations has been going on in the last decades in Italy: changes have occurred from the conflicts of the '60s, through an intermediate phase, up to the emerging open-dialog relations since the end of the '80s. Some (Cigoli, 1988) have even talked of a sort of *symbiosis* between parents and their sons and daughters. The point is that this symbiosis risks to degenerate from protective to hyper-protective: intended as a support to the self-realization of the young one, it actually can fail in setting this task into a dimension of responsible independence aimed at forming a family and an offspring of his/her own.

7. Education expansion is a factor, which has been given increasing attention when focusing on the timing of marriage and entry into motherhood. It can operate in a twofold way: there may be a simple delaying effect, due to the fact that young spends more time in school, thus postponing the end of their studies (educational *enrolment*); there may also be a Beckerian effect of the educational *attainment*, which, providing better work chances, may yield a negative effect on the rates of entry into marriage and motherhood (see, for example, Blossfeld and De Rose, 1992).

8. The aim of this study is to perform an analysis based on the implementation of a demographic model which:

- is able to describe the interrelations between the process(es) of transition to adulthood and the reproductive behaviour
- offers the possibility of interacting with the model parameters in order to perform different simulative scenarios, according to a set of corresponding hypothesis, as introduced in the following paragraph and presented, in detail, in the results' section.

[4] This issue poses three major questions: first of all, there' s the problem of *definition*: residential independence does not always correspond to economic independence. Secondly, the process of leaving the parental home is a multi-phase one, (possibly) involving several steps and can be reversible. In third place, *official* residence seldom corresponds to the *real* one for groups such as young people studying far from home. This inherent complexity makes data collection and statistical elaboration crucial.

[5] Micheli (1997) critiques the adequacy of any *rational choice* approach in this case firstly because it does not take into account changes in social norms and values that others (Cigoli, 1988; Scabini, 1997) have indicated as crucial; secondly, it is not able to explain the differentials between the northern and southern Italy, seeming to be valid only for the latter (Billari and Ongaro, 1997; De Sandre, 1997).

9. The basic idea is to follow a group of people, as its members experience with time events which are crucial for their transitions to adulthood: educational career, forming and dissolution of unions (both consensual unions and marriages), reproduction. Once this set-up - whose framework is described in the following section - is defined, the simulative phase begins: changes on the way people enter unions are introduced and the consequent results on fertility are then discussed. Furthermore, all this has been done for different subgroups of the population (again, see the results' section).

Method

10. The present study has employed the dynamic multidimensional projection model LIPRO, using the computer program, which goes by the same name. It has been developed at the NIDI[6] (van Imhoff and Keilman, 1991; van Imhoff, 1995) and several scholars have adopted it since its first release (among them: Righi and Sorvillo, 1992; Boulanger *et al*, 1994; Lindgren and Vikat, 1995; Murphy and Wang, 1995; Keilman and Brunborg, 1995).
The early developments of multidimensional models have to be traced in the multiregional models (Rogers, 1975; Willekens and Drewe, 1984) and in the marital status models (Willekens *et al*, 1982). The application to household dynamics is quite recent and the present study can be thought of as a further step of this development.

11. The basic principles of LIPRO are those of a multidimensional model (Hoem and Funck Jensen, 1982): a population broken down by certain characteristics defines a state-space. A vector in the state-space is a state-vector representing the population at a particular point in time, its elements corresponding to the number of individuals in the various positions of the state-space.

12. The development of the population is described in terms of jumps/events: between $t-1$ and t. Some individuals may leave and enter the population (external events) or move between distinct positions of the state-space, remaining in the population throughout the time interval (internal events). The jumps are determined by the model parameters: *transition probabilities* or, equivalently, *transition rates* (*intensities*).

13. Taking account for these events, the state-vector at time $t-1$ is updated at time t ($t+1, t+2$, …).

14. The following introduces the basic concepts of LIPRO. Let X be a continuous non-negative random variable[7], representing time or age[8], and $S=[1,...,p]$ a finite collection of states. Consider a random individual who jumps from one state to another as time varies. The process can be then described by random variables $I_i(x)$ such that $I_i(x)=1$ if the individual is in position i ($i=1,...,p$) at time x, zero otherwise.

15. Once the state-space is defined, all that the model requires for running is a starting population and transition *probability* matrix $P(x,y)$ or a transition *intensity* matrix $M(x)$. A formulation that relates probabilities (p_{ij}) to intensities (m_{ij}) is the following:

[6] Under the research project "The impact of changing living arrangements on social security expenditures in the Netherlands".
[7] Capital letters are used for the variables, while small ones are for realizations.
[8] Hoem and Funck Jensen (1982) call it *seniority*.

(1) $$m_{ij}(x) = \lim_{h \downarrow 0} \frac{p_{ij}(x, x+h)}{h}, i \neq j$$

where:

(2) $$p_{ij}(x, y) = \Pr[I_j(y) = 1 \mid I_i(x) = 1]$$

16. Intensities are different from probabilities since they can take values larger than one[9].

17. Under specific assumptions[10] , which give rise to the *exponential model*, the following relation is also valid:

(3) $$P(x, x+h) = \exp(M(x)h)$$ [11]

18. An alternative formulation relies on the so-called *linear integration* hypothesis: namely it assumes that events are uniformly distributed over age- or time-intervals. In this case (3) can be re-formulated in the following way:

(4) $$P(x, x+h) = [I + \frac{h}{2} M(x)][I - \frac{h}{2} M(x)]^{-1}$$

19. The LIPRO offers the possibility to choose between the two specification and the exponential is the one adopted here[12].

20. In the present study the *life table* approach of the LIPRO has been implemented: an imaginary cohort of 100.000 women, disaggregated according to the distinct positions of a defined state-space, are followed from birth up to age 50. Only internal events have been introduced: no exit from the initial cohort

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[9] Having defined $d_{ij}(x, y)$ as the expected number of jumps from i to j between x and y (*occurrences*) and $L_i(x, y) = E[\int_x^y I_i(s)ds]$ as the expected time spent in position i in the same time interval (*exposure*), it can be shown that the following relation holds: $\lim \frac{d_{ij}(x, x+h)}{L_i(x, x+h)} = m_{ij}(x)$

[10] If the process is Markovian and time-homogeneous the intensities are piecewise constant within the time intervals: $m_{ij}(x+h) = m_{ij}$ for $0 < h \leq t$. In this formulation the individual stays in position i an exponentially distributed lenght of time with mean $-\frac{1}{m_{ii}}$, then jumps to another position, say j , with probability $-\frac{m_{ij}}{m_{ii}}$ and so on. m_{ii} is defined as $m_{ii} = -\sum_{j \neq i} m_{ij}$.

[11] P is a p order square matrix with p_{ij} ($\sum_j p_{ij} = 1$) as generic element; M is a p order square matrix with m_{ij} as generic element, the elements on the main diagonal being defined as in the previous note.

[12] The *linear integration* hypothesis can lead to implausible results (such as negative probabilities and negative numbers of individuals).

is thus possible, neither new members may enter it. This means that all the 100.000 women stay in the table until they reach the upper age-limit[13]. As they grow older (five-year age-intervals have been adopted) they *jump* between different positions, thus experiencing the corresponding demographic events that those jumps/transitions imply.

21. The specification of the state-space is crucial because of the trade-off between the model complexity on one side, and its predictive power and statistic validity, on the other: models with several states are likely to be more informative but require huge efforts for estimating the rates that the model design itself implies. Thus it is wise to specify a state-space with enough dimensions in order to be sufficiently valid for the purposes of the analysis, and be at the same time confident that the parameters estimation is not critical.

22. The state-space specified in this analysis consists of 18 distinct internal positions, which result from the combination of the categories of the following three status variables:

1. Union status – single (coded SIN), cohabiting (COH), married (MAR)
2. Education status – enrolled (E), no longer enrolled (F)
3. Parity – childless (0), one-child woman (1), woman with at least two children (2)

23. Thus, for example, the position COHE0 corresponds to a cohabiting student who has not had any children, and MARF2 indicates a currently married woman who has completed her education and given birth to at least two children.

24. Such a state-space defines a set of 306[14] events, that is immediate jumps between any two different internal positions. The jump from position SINE0 to COHF0, for example, implies the beginning of a consensual union and the end of the studies. Not all the 306 events are possible: some of them are logically impossible (those corresponding to a decrease in the parity), others by assumption. This is true for all multiple events and for any event which implies shifting from married to cohabiting: it has been assumed that this can be done only via the intermediate state single.

25. For each of the 51 possible transitions age-specific transition rates have been estimated through sets of logistic regressions. In any regression each woman is followed retrospectively month by month: from the month in which she celebrated her fifteenth birthday up to the month when the event occurred (if it did) or up to the month of interview[15] (if she never experienced the event in question).
This event history technique, performed with the use of the SAS *logistic* procedure, looked into the impact of certain background variables on the events of interest. The variables used are: the age at which the event occurred, union status, parity, educational enrolment status, religiosity and whether the woman was born before year 1960, or later. This sort of cohort variable has been included in order to account for more recent behaviours, and has been employed in all the expression for computing the probabilities from the coefficients' estimates[16].

[13] The reasons for not having introduced mortality are based on the following two considerations: mortality is very low before age 50. Secondly, the age- and position-specific rates that the model would require are hard to provide and, in any case, they should come from an external source.
[14] 18 x 17.
[15] Set as December 1995 for all the respondents.
[16] In any regression only a subset of the variables are entered: when modeling union formation, for example, union status is left out; when modeling any increase in the parity, parity is left out, and so on.

26. LIPRO has then calculated the transition *probability* matrix from the occurrence-exposure *rate* matrix – see formula (3) - using an internal algorithm which computes the exponential of a matrix through its Taylor series expansion.

27. At birth the entire population is in SINE0 (all the women are enrolled in school, with no partner, nor children) and it has been assumed that it stays in that position until age 14. This has been obtained by setting all the transition rates for age groups 0-4, 5-9, 10-14 equal to zero. For subsequent age groups the estimated intensities have been applied.

28. LIPRO produces the so-called experience tables, particular life-tables restricted to those members of a life table population who have experienced at least one specific event. They are constructed as ordinary life tables (starting from an initial population, age-specific rates are applied to the surviving proportion) and refer to an *events set*. This specifies the events, the experience of which changes the status of an individual from "never experienced" to "at least experienced once".
In this analysis three distinct sets of experience tables have been computed: women who have married at least once, who have started at least one cohabitation and women who have given birth to at least one child. For such tables, LIPRO can also calculate the mean age at experiencing the first event[17]. It has also been possible, in this way, not only to determine how many women resulted having experienced, in any age-group, a consensual union, a marriage and the entry into motherhood, but also the dynamics of *dissolution* of these unions.

Data

29. The data source employed in this study is the Family and Fertility Survey (FFS) conducted in Italy between the end of 1995 and the beginning of the following year within the project co-ordinated by the Economic Commission for Europe and the Population Activities Unit of the United Nations. 4824 women aged 20-49 have been submitted a questionnaire in which questions on their current status were asked together with retrospective information with respect to, among others, education, partnership and childbearing histories.

Results

30. Four different sets of model runs have been performed, one for each of the following "areas":

Area 1 – Central and northern Italy, high religiosity
Area 2 – Central and northern Italy, low religiosity
Area 3 – southern Italy, high religiosity
Area 4 – southern Italy, low religiosity

31. As introduced at the end of the first section, one goal of the present study is to perform an analysis which not only models (thus helping interpret and understand) the complexity of the family formation process(es), but also to investigate differential behaviours and different response to the same modifications of those behaviours themselves. In order to do this, subgroups of the population had to be defined. Why

[17] The basic assumption for calculating the mean ages is that, for a particular age group, all events on average occur at the same mean age. See van Imhoff and Keilman (1991) for the details and van Imhoff (1990) for the exact mathematical formulation.

geographical residence and religiosity as the two dimensions for this stratification? As for the former, some scholars (see, for example, Santini 1997) have identified two distinct reproductive "models", one for the central and northern regions of Italy, and one for the rest of the country[18]. It is also a dimension which is essential for the differentials, for example, in the timing of leaving the parental home or the *quantum* and *tempo* of consensual unions.

32. Religiosity has been considered a good proxy of social norms and values which, again, are crucial for grasping the differentials in patterns of family formation and dissolution and reproduction.

33. In order to have a richer picture, others factors (such as, for example, educational attainment) should have been introduced in addition to the used ones; one could have also coded the used two with more categories. This has not been done because the consequent increase in complexity which resulted from preliminary runs – due mainly, but not exclusively, to the difficulties in estimating the model parameters – produced an amount of output of a non-straightforward interpretation. My opinion is that the improvements of the present approach should primarily focus on the specification of the state-space.

34. The baseline of the present simulations is to observe what happens to fertility when changes occur in the way people enter unions. In pursuing this task, one has to define which changes have to be taken into consideration and how to implement this in the model design (which parameter to intervene on and how).

35. Starting from the consideration that being enrolled in school resulted in a lower relative risk for starting *any* kind of union (not only marriages), it has been decided to increase all the rates of entry into consensual union to the value that the corresponding non-students have (Model 1): this first *what-if* simulation aims at checking what effects an imaginary increase of popularity of consensual unions among students would yield in any of the four areas. A bell-shaped age pattern of the rates of entry into a consensual union has been found in three of the four areas (namely the first three). To interpolate the curve with a function (*gamma*, for instance) and then change (some of) the parameters would have been an appropriate analytical solution for modifying the rates: this was not possible because there were too few points[19] compared to the number of parameters to be estimated. So it has been decided to simply adopt a face-value approach (Model 2) as described in the next paragraph: consensual unions are supposed to be highly popular from age 15-19 onwards. In the third model one wants to see whether the combined action of model 1 and 2 produces intermediate effects or not. Finally, it has also been chosen (Model 4) to intervene *only* on the marriage rates, in the same way it has been done in the second model.

Model 0 is a benchmark model in each area: the rates estimated with logistic regressions have not been altered.

Model 1 – rates for entry into a consensual union for currently enrolled women have been set equal to the rates for their same age corresponding non-students

Model 2 – the bell-shaped age patterns of the rates for entry into a consensual union have been modified in the following way: the rising section of the curves (the left hand ones) have been set equal to the maximum (the peak of the curve)

Model 3 – Parameter modifications performed with models 1 and 2 have been jointly introduced

Model 4 – Same as model 2, but applied to marriage rates

[18] In northern and central Italy one-child families represent an increasing proportion of all the families. In the South, on the other hand, women enter motherhood relatively less but, when they do, they are more likely to have at least two children: data show that the natality decline is here almost completely due to a decrease of third order and higher births.

[19] With one-year age groups the fitting is likely to be much easier.

36. Model 2 and Model 3 have not been applied to the fourth area, because the age patterns for the rates of entry into a consensual union haven't shown a bell-shaped curve.

37. In each area and for each model (with the exception just mentioned) the following LIPRO output has been obtained:

- a *life table* with the population disaggregated by position in the state-space and age-group
- a *birth table* containing the corresponding births, by position in the state of the mother at birth of the child
- one *experience table* for women who started at least one consensual union
- one *experience table* for women who started at least one marriage
- one *experience table* for women who had at least one child

38. Further elaborations have been performed on this output that LIPRO produced: starting from the first set of experience tables, women who have started at least one consensual union are disaggregated according to their union status: it is thus possible to check how many – by any age[20] – stopped cohabiting (those in one of the six positions corresponding to the state *single*[21]), how many are still in the consensual union (those in one of the six positions corresponding to the state *cohabiting*[22]) and how many transformed their union in a formal marriage (those in one of the six positions corresponding to the state *married*[23]).

39. The same has been done also with the set of experience tables relative to marriages.
As for fertility, the birth tables produced by LIPRO[24] have been used as an input for subsequent elaboration as well. Combining together the positions of the state-space in different ways, births have been distinguished by the age group of the mother at birth and by:

- the mother's school enrolment status
- the mother's union status
- new-born's birth order

40. These tabulations are important because they integrate the information one gets from the experience tables, both on reproductive and union dynamics; very extreme cautions has to be adopted, anyway, since the width of the age-groups is likely to hide the real order in which events occur. What is more, this may happen in different ways in the various areas and, in any area, for the various age groups. For this reason, these tables have been used as supplementary source of information and as tool for checking *inter-* and *intra-*area differentials.

41. The analysis of the LIPRO output and its elaboration will be done in the following way: in first place, the resulting dynamics of consensual unions are discussed under a inter-area and intra-area perspective. The same is then done for the dynamics of marriages. Finally, the reproductive behaviours

42. are studied and conclusions drawn under an integrated perspective.
Before presenting the results, one preliminary warning: the logistic regression estimates for the southern areas are poorer than for the northern ones. The intercept, simple effects and general fit of the model are

[20] The tabulations presented in this paper refer only to the oldest age-group
[21] SINE0, SINE1, SINE2, COHE0, SINF0, SINF1, SINF1.
[22] COHE0, COHE1, COHE2, COHE0, COHF0, COHF1, COHF1.
[23] MARE0, MARE1, MARE2, COHE0, MARF0, MARF1, MARF1.
[24] The table *Births by state of the mother*.

valid, but some of the interactions (especially those with the *religiosity* variable) are in some cases not statistically significant. The main consequence is that extra caution has to be adopted when comparing the differences between area 3 and area 4.

Consensual unions

43. When comparing the *quantum* (number of women who, at the age of 50, result having started at least one consensual union) and the *tempo* (mean age at the beginning of the first experience of cohabitation) two main considerations emerge: in first place, the phenomenon of consensual unions is still quite marginal in Italy and not a juvenile one. Secondly, large differentials are found among women characterized by different levels of religiosity and residing in different regions of the country[25].

Table 1

	Benchmark	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Area 1	10329 (32,9)	10975 (32,1)	17819 (28,3)	14714 (28,7)	13010 (28,3)
Area 2	15011 (27,9)	15472 (27,6)	23063 (25,1)	24126 (24,9)	13154 (27,7)
Area 3	3070 (28,8)	4018 (28,6)	8567 (26,0)	5882 (26,1)	5092 (25,6)
Area 4	5809 (25,4)	8337 (24,1)			7271 (23,8)

Women having started at least one non-matrimonial cohabitation, by area and model
Mean age at beginning of first cohabitation in parenthesis

44. Considering the *benchmark* model first, one can see that consensual unions are, as expected, more common among people living in the North and in the Center (of the original 100.000 women at age 15, 10.3 per cent had had at least one cohabitation at age 50 in Area 1, and 15.0 per cent in Area 2) and among those with a lower level of religiosity (15.0 per cent and 5.8 per cent in Areas 2 and 4, respectively). The mean age at first cohabitation is fairly high in all the areas (with the possible exception of the fourth) reaching 32 years for the women of area 1.

45. Turning to model 1, no major changes occur in the first two areas (this happens more clearly in the fourth one where the total number of women who result having started a cohabitation increases by 43%, the mean age at first cohabitation dropping there by more than one year[26]). The explanation for this non-effect has to be ascribed to the non-juvenile feature of consensual unions: students are less represented at higher ages where the propensities to cohabit are relatively higher: further increases in school enrolment, (possibly) together with modifications of the differential propensities to cohabit between students and non-students may determine a complete different reality.

46. When the model 2 is adopted stronger effects arise, both in intensities and timing of consensual unions, in any area. Model 3 produced mixed results. Shifting now from the experience tables to the elaboration made on them (tables 2a, 2b, 2c and 2d), some interesting evidence emerges. The most striking feature is related to the behaviour that cohabitants in the area 2 show (table 2b): not only are they the ones

[25] This heterogeneous picture might suggest that there are *strata* of the population (not necessarily coinciding with the areas specified in this study) which may lead an increase in the diffusion of consensual unions. On the other hand, the peculiar characteristics of this phenomenon, even among those more prone to cohabit, make it difficult to believe that it will constitute a real alternative to marriage.

[26] The gap between the estimated propensities to cohabit for students and non-students is probably higher than in reality among women belonging to the southern areas: this might be due to a higher reluctance in reporting to be cohabiting while studying (more often then in the North) far from home.

who exhibit the highest proportions of people choosing – at any age – this form of union, as just observed, they also disrupt them much more and quicker than the others. At the age of 50, 37% of the 15.000 consensual unions started by up to then resulted being broken up, 61% transformed into a marriage and only the remaining 1,65% of the women who started a cohabitation was still in the consensual union. This picture holds constant in this area, regardless for the model. In the first area (table 2a) the proportions are, respectively, 17%, 41% and 42% for the *benchmark* model, changing slightly in the other models (17%, 26% and 57% in the third model; 17%, 30% and 53% in the third). Women belonging to the two southern areas (tables 2c and 2d) show their tendency not to disrupt their (few) consensual unions, opting for keeping living with their partners (area 3) or turning their union into a formal marriage (area 4).

Marriages

47. We now proceed in the same way as in the analysis of the dynamics of consensual unions. Looking at table 3, one sees that changes in the propensity of starting a consensual union have produced very little – if any – effects on the dynamics of marriages. Still some differentials are present, but they require caution when being interpreted because the relative magnitude of the differences is often small and they are the results of complex dynamics which hardly can be detected looking only at the final numbers.

Table 3

	Benchmark	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Area 1	70714 (28,3)	70838 (28,2)	72468 (27,9)	71665 (28,1)	76275 (26,3)
Area 2	67932 (28,0)	68071 (27,9)	70043 (27,7)	70347 (27,7)	72425 (26,4)
Area 3	69970 (26,6)	69985 (26,6)	69961(26,6)	70064 (26,6)	75750 (24,9)
Area 4	73225 (26,8)	73713 (26,7)			78653 (25,2)

Women having married at least once, by area and model
Mean age at first marriage in parenthesis

48. At least 70 per cent of the initial 100.000 women had married at least once before age 50; the mean ages at first marriage are around 28 years for central and northern Italy, about one year lower in the other two areas (table 3). The first model produces no relevant changes of these values in any area. Model 2 yields some small and presumably negligible, positive effects on marriages, limited to the first two areas. The results of model 3, again, are difficult to interpret. Finally, the application of the fourth model has a general positive effect on marriage *formation* dynamics in any area: the mean age at first marriage drops by around 2 years and the number of married women by the age of fifty increases considerably.

49. Switching now to the dynamics of marriage *dissolution* (tables 4a, 4b, 4c and 4d), the only relevant evidence is the higher proportion of broken-up marriages among women belonging to the second area – some 20% - almost double than that of the first area and significantly higher than the remaining two as well.

Reproduction

50. Looking at the estimated TFRs (total number of births to the initial cohort of 100.000 women, table 5), almost identical and very low levels of fertility are found in the first two areas, higher ones for the remaining two. If differentials by macroregion of residence are in line with *ex-ante* expectations, differentials by religiosity need further investigation.

Table 5

	Benchmark	Model 1	Model 2	Model 3	Model 4
Area 1	103316	103746	108614	106558	120578
Area 2	103945	104264	110099	110922	118236
Area 3	165861	166027	170391	197952	198349
Area 4	205507	208695			263374

Estimated TFR x 100.000, by area and model

51. Considering the *benchmark* model first, the proportions of women who result having entered motherhood range from around two-thirds of the first area up to three-quarters of the fourth one, mean ages all levelling off around 29 years of age. The application of model 1, not surprisingly, resulted in no significant changes of the reproductive behaviours: the effect on cohabitation and marriage dynamics have also turned out to be very scarce, as previously shown and birth rates among cohabitees are low. Model 2 produced some positive effect on fertility but the disaggregation of these births by union status, school enrolment status and birth order is virtually the same, as shown later in this section: it is thus difficult to trace the processes behind this increase which, also in consideration of its small numerical entity, should not given too much consideration.

52. At last, the fourth model: the mean age at first birth generally decreases by one year, the TFR in the two northern areas reaches 1.2, it sets at almost 2 in the third area and rises up to 2,6 in the fourth one, a figure which is more than double the current TFR in Italy.

Table 6

	Benchmark	Model 1	Model 2	Model 3	Model 4
Area 1	63483 (29,1)	63691 (29,1)	66059 (28,9)	64966 (28,9)	70136 (27,8)
Area 2	61498 (29,0)	61654 (29,0)	64200 (28,7)	64575 (28,6)	66368 (27,9)
Area 3	65420 (28,1)	65783 (28,1)	67464 (28,0)	66279 (28,0)	72688 (26,8)
Area 4	78406 (28,6)	79284 (28,4)			83458 (27,1)

Women having given birth to at least one child, by area and model
Mean age at first birth in parenthesis

53. Let us now examine the disaggregation of the births by *union status* of the mother (not shown). With respect to the *benchmark* model, higher proportions of births out-of-wedlock are relative to women residing in northern and central Italy (17% in area 1 and 20% in area 2). Model 1, as now obvious, does not give rise to any relevant change in this figures. The same is true for model 2 and model 3 as well (even though the low proportion of births to cohabiting mothers increase slightly). As for the last model, one observes the expected result that the proportion of births to married women rises.

54. Checking then how the births result disaggregated by the *school enrolment status* (not shown) of the mother, the main difference emerges between the less religious (more likely to have a baby before the end of the school) and the more religious ones who choose this option in very few cases. Once again, what strikes is the specificity of the non-traditional behaviour of the women belonging to the second area.

55. Finally, the tabulations which distinguish the births by *order* are investigated (tables 7a, 7b, 7c and 7d). Here is the geographical dimension that accounts for the larger differences. The proportion of births of first, second and subsequent order are, respectively, 60%, 30% and 10% in the central and northern regions of Italy; the corresponding values for the other two areas are 40%, 39%, 30%. This result can be interpreted as a (at least partial) confirmation of the theory of the two reproductive models (see note *15*).

56. The difference in reproduction behaviours between the more and less religious women residing in the southern regions of Italy are striking and somewhat counter-intuitive; still, an analytical explanation is possible. Considering that the mean age at birth of the first child is almost identical and that the proportion of women who enter motherhood is much higher among the less religious, one could guess that this is mainly due to their higher propensity to marry[27]: looking at the experience tables relative to marriages, this is confirmed, at least partially. Following this line of interpretation, the reasons for the observed difference in marriage dynamics have to be understood. One possibility is strictly related to the technique adopted for the estimation of the model parameters[28]: The interaction between the cohort variable and the religiosity variable is positive (i.e. $\exp(b)$ is lower than one) among women residing in the South – where many estimates are not very significant – while the contrary happens in the North: this is true both in the regressions which model the probability to marry and in those which model the increases in parity (especially from parity 1 to parity 2). Differences in timing of first marriage and first birth in the South need further investigation, not ignoring, indeed explicitly and accurately taking into account the trends that the younger generations seem to follow.

[27] This interpretation makes sense in a social and demographic context as the one in southern Italy, where marriage is the traditional and by far the most common form of union for couples who plan to have children.
[28] See the beginning of this section.

UNION STATUS OF WOMEN WITH AT LEAST ONE COHABITATION AT THE AGE OF 50, BY AREA AND MODEL
ABSOLUTE AND RELATIVE NUMBERS[29]

Table 2a
Area 1

b.mark		Single	Cohab.	Marr.	Sum
	abs.	1714	4280	4334	10328
	rel.	16,6	41,44	41,96	100

Mod. 1		Single	Cohab.	Marr.	Sum
	abs.	1852	4326	4796	10974
	rel.	16,88	39,42	43,7	100

Mod. 2		Single	Cohab.	Marr.	Sum
	abs.	2985	4622	10214	17821
	rel.	16,75	25,94	57,31	100

Mod. 3		Single	cohab.	Marr.	Sum
	abs.	2571	4423	7720	14714
	rel.	17,47	30,06	52,47	100

Table 2b
Area 2

b.mark		Single	Cohab.	Marr.	Sum
	Abs.	5668	248	9094	15010
	Rel.	37,76	1,65	60,59	100

Mod. 1		Single	Cohab.	Marr.	Sum
	Abs.	5818	256	9399	15473
	Rel.	37,6	1,65	60,74	100

Mod. 2		Single	Cohab.	Marr.	Sum
	Abs.	7867	366	14829	23062
	Rel.	34,11	1,59	64,3	100

Mod. 3		Single	Cohab.	Marr.	Sum
	Abs.	8183	382	15561	24126
	Rel.	33,92	1,58	64,5	100

Table 2c
Area 3

b.mark		Single	Cohab.	Marr.	Sum
	abs.	265	2288	1315	3868
	rel.	6,85	59,15	34	100

Mod. 1		Single	Cohab.	Marr.	Sum
	abs.	283	2334	1399	4016
	rel.	7,05	58,12	34,84	100

Mod. 2		Single	Cohab.	Marr.	Sum
	abs.	732	4220	3616	8568
	rel.	8,54	49,25	42,2	100

Mod. 3		Single	Cohab.	Marr.	Sum
	abs.	511	2912	2457	5880
	rel.	8,69	49,52	41,79	100

Table 2d
Area 4

b.mark		Single	Cohab.	Marr.	Sum
	Abs.	568	1943	3296	5807
	Rel.	9,78	33,46	56,76	100

Mod. 1		Single	Cohab.	Marr.	Sum
	Abs.	953	2329	5055	8337
	Rel.	11,43	27,94	60,63	100

[29] Model 4 is not shown because it refers to changes in the propensity to *marry*, not to *cohabit*.

UNION STATUS OF WOMEN WITH AT LEAST ONE MARRIAGE AT THE AGE OF 50, BY AREA AND MODEL
ABSOLUTE AND RELATIVE NUMBERS

Table 4a
Area 1

b.mark		Single	Cohab.	Marr.	Sum
	abs.	8091	329	62292	70712
	rel.	11,44	0,47	88,09	100

Mod. 1		Single	Cohab.	Marr.	Sum
	abs.	8113	330	62396	70839
	rel.	11,45	0,47	88,08	100

Mod. 2		Single	Cohab.	Marr.	Sum
	abs.	8348	338	63781	72467
	rel.	11,52	0,47	88,01	100

Mod. 3		Single	Cohab.	Marr.	Sum
	abs.	8268	333	63062	71663
	rel.	11,54	0,46	88	100

Mod. 4		Single	Cohab.	Marr.	Sum
	abs.	9277	344	66656	76277
	rel.	12,16	0,45	87,39	100

Table 4b
Area 2

b.mark		Single	Cohab.	Marr.	Sum
	Abs.	13638	5	54288	67931
	rel.	20,07	0,01	79,92	100

Mod. 1		Single	Cohab.	Marr.	Sum
	Abs.	13664	5	54400	68069
	rel.	20,07	0,01	79,82	100

Mod. 2		Single	Cohab.	Marr.	Sum
	Abs.	14029	5	56008	70042
	rel.	20,03	0,01	79,96	100

Mod. 3		Single	Cohab.	Marr.	Sum
	Abs.	14093	5	56249	70347
	rel.	20,03	0,01	79,96	100

Mod. 4		Single	Cohab.	Marr.	Sum
	Abs.	14711	7	57708	72426
	rel.	20,31	0,01	79,68	100

Table 4c
Area 3

b.mark		Single	Cohab.	Marr.	Sum
	abs.	10468	33	59479	69980
	rel.	14,96	0,05	84,99	100

Mod. 1		Single	Cohab.	Marr.	Sum
	abs.	10470	33	59485	69988
	rel.	14,96	0,05	84,99	100

Mod. 2		Single	Cohab.	Marr.	Sum
	abs.	10458	36	59467	69961
	rel.	14,95	0,05	85	100

Mod. 3		Single	Cohab.	Marr.	Sum
	abs.	10484	33	59547	70064
	rel.	14,96	0,05	84,99	100

Mod. 4		Single	Cohab.	Marr.	Sum
	abs.	11336	35	64378	75749

Table 4d
Area 4

b.mark		Single	Cohab.	Marr.	Sum
	Abs.	9560	17	63648	73225
	rel.	13,06	0,02	86,92	100

Mod. 1		Single	Cohab.	Marr.	Sum
	Abs.	9667	18	64028	73713
	rel.	13,11	0,02	86,86	100

Mod. 4		Single	Cohab.	Marr.	Sum
	Abs.	10511	19	68122	78652
	rel.	13,36	0,02	86,61	100

rel.	14,97	0,05	84,98	100

BIRTHS BY ORDER, AREA AND MODEL
ABSOLUTE AND RELATIVE NUMBERS

Table 7a
Area 1

b.mark		1st	2nd	3rd+	Sum
	abs.	63482	29218	10615	103316
	rel.	61,44	28,28	10,28	100

Mod. 1		1st	2nd	3rd+	Sum
	abs.	63691	29367	10688	103746
	rel.	61,39	28,31	10,3	100

Mod. 2		1st	2nd	3rd+	Sum
	abs.	66059	30975	11580	108614
	rel.	60,82	28,52	10,66	100

Mod. 3		1st	2nd	3rd+	Sum
	abs.	64967	30371	11220	106558
	rel.	60,97	28,5	10,53	100

Mod. 4		1st	2nd	3rd+	Sum
	abs.	70136	35315	15127	120578
	rel.	58,17	29,29	12,55	100

Table 7b
Area 2

b.mark		1st	2nd	3rd+	Sum
	Abs.	66612	50170	49079	165861
	Rel.	40,16	30,25	29,59	100

Mod. 1		1st	2nd	3rd+	Sum
	Abs.	66673	50234	49120	166027
	Rel.	40,16	30,26	29,59	100

Mod. 2		1st	2nd	3rd+	Sum
	Abs.	68627	51960	49804	170391
	Rel.	40,28	30,49	29,23	100

Mod. 3		1st	2nd	3rd+	Sum
	Abs.	78792	59593	59567	197952
	Rel.	39,8	30,1	30,09	100

Mod. 4		1st	2nd	3rd+	Sum
	Abs.	73646	58467	66236	198349
	Rel.	37,13	29,48	33,39	100

Table 7c
Area 3

b.mark		1st	2nd	3rd+	Sum
	abs.	61498	30259	12188	103945
	rel.	59,16	29,11	11,73	100

Mod. 1		1st	2nd	3rd+	Sum
	abs.	61653	30372	12239	104264
	rel.	59,13	29,13	11,74	100

Mod. 2		1st	2nd	3rd+	Sum
	abs.	64199	32447	13453	110099
	rel.	58,31	29,47	12,22	100

Mod. 3		1st	2nd	3rd+	Sum
	abs.	64574	32747	13601	110922
	rel.	58,22	29,52	12,26	100

Mod. 4		1st	2nd	3rd+	Sum
	abs.	66367	35196	16673	118236
	rel.	56,13	29,77	14,1	100

Table 7d
Area 4

b.mark		1st	2nd	3rd+	Sum
	Abs.	78406	59354	67747	205507
	Rel.	38,15	28,88	32,97	100

Mod. 1		1st	2nd	3rd+	Sum
	Abs.	79285	60453	68957	208695
	Rel.	37,99	28,97	33,04	100

Mod. 2		1st	2nd	3rd+	Sum
	Abs.	83458	66876	86040	236374
	Rel.	35,31	28,29	36,4	100

Concluding remarks

57. The analysis of the great amount of computer output has suggested interesting lines of interpretation: some of the results were in line with *a priori* expectations, others were somewhat surprising. The process of transition to adulthood is a complex one: this study is intended as an attempt to model this complexity with the use of a multidimensional model, combining the macro approach of the model design itself with the micro perspective of the individual-based logistic regressions for estimating the model parameters.

58. Increasing cohabitation has resulted in small increases of fertility: this is mainly due to the numerical marginality of the phenomenon, on one side and on the intrinsic characteristics of these unions, on the other: mean age at first cohabitation is quite high, birth rates to cohabitees are low and consensual unions are seldom a real alternative to marriage. Still, differences exist among people belonging to particular *strata* of the population (see note *21*): the recognition and identification of such characteristics is essential.

59. The results of model 3 have often been difficult to interpret, confirming that a simple and rough superimposing of different models makes little sense: one has to have in mind a precise hypothesis – corresponding to a certain *real* form of demographic behaviour – to test within the model and an analytical solution to translate this into parameters' modifications.

60. Under the methodological point of view, many questions are open. In the LIPRO there is only one *time* dimension (age, in the present study). This limit is , anyway, because the focus of the analysis is mainly on first union and first child and, to a minor extent, on subsequent demographic events (further children and dissolution of unions): age is the *time*-dimension which presumably which serves this purpose best (not ignoring, that time from union from crucial events such as, for instance, first sexual intercourse, may be relevant). Further improvements have to primarily focus on the following two basic issues: in the first place, one-year age groups should be employed. Secondly, a different state space could be adopted, with the inclusion, for instance, of a fourth modality in the union status in order to distinguish women who do not cohabit with a partner (currently *single*) but live alone from those still in the parental home. In pursuing both tasks, anyway, the quality of the data is crucial (see note *4*). Educational attainment may also be introduced in the state-space since it is a time-varying variable whose potential effects on the timing of the steps involved in the family formation process have to be taken into account. Finally, one could have also chosen to intervene on the fertility rates and not on the rates of union formation; this approach is completely different from the one adopted here, under the methodological and conceptual point of view.

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