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Having children in Italy. Their effects on union stability and a focus on the birth path in Tuscany

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INTRODUCTION

At the beginning of the second half of the 20th Century, after the Second World War, Italy had not yet completed the demographic transition that had started nearly one century before. The increase in population, the expansion of life expectancy, the decline in fertility, and the reduction in mortality were all ongoing processes, which would continue until the beginning of the Seventies.

However, the last three decades of the 20th century marked a new phase. By 1970, the demographic gap that Italy had with respect to the other European countries had almost disappeared, and the demographic transition could be viewed as ended. In the meantime, secularised values and orientations started to emerge in the Italian civil society, and in the decade 1970-1980 even the family legislation - still old-fashioned - followed the new value orientations and attitudes. Several important demographic transformations characterised the Italian society: the drop of fertility; the constant decline of mortality; the rapid ageing of the population; the end of out-migrations and the progressive turn of Italy into a country of immigration.

Perhaps the most remarkable transformation was the fertility decline, while other remarkable family-related demographic events, such as separations and divorces, cohabitations, the number children born outside marriage, and one-parent families, began to rise in Italy only in the second half of the Nineties.

It is well recognized that family-related events are strictly interrelated, and involve both partners. Union stability may influence the couple's fertility, and the presence of children affects the solidity of a couple. Nowadays, the presence of children may imply different conditions and situations: contrary to what happened in the past when only the biological children of the couple were present, contemporary families may include also adopted or foster children, and stepchildren, with uncertain effects on the stability of the union.

Because children are rarer, they have also become more precious to their parents and to society. This has important consequences on family life: parents' attitude towards the child has put more and more emphasis on safety and protection, even before their birth. This greater attention has translated, among other things, into an increased medicalization of pregnancy (ISTAT 2006; Wagner 2001), which then conducted to the definition of a model of prenatal care, for both the mother and the unborn child (Banta 2003). In the growing interest in the use of indicators of service quality, even maternity services have been subject

to assessment, where women's satisfaction towards the recovery for delivery shows to have positive implications for the health and well-being of the mother and the child (Laurence 1997; Mackey 1995; Simkin 1991; Simkin 1992; Slade et al. 1993; Waldenstrom et al. 1996).

The purpose of this thesis is to gain insight into two themes tied to the Italian fertility. More specifically, it aims to a greater comprehension of some results already present in the literature, complementing them with findings for Italy; it points out some aspects that need a clarification, given the contrasting results found in the literature; finally, it focuses on some features that have not yet been investigated.

The first theme concerns the relationship between fertility and union dissolution in Italy. Among the several demographic features that might affect the disruption of couple relationships, some are related to childbearing, such as the number, age, and (possibly) sex of children, their legal status (biological, adopted, foster or stepchildren) and the timing of their birth in relation to union formation (e.g., Andersson 1997; Waite and Lillard 1991). Empirically, the impact of childbearing on union dissolution needs some clarifications. The influence of many aspects of childbearing on union dissolution have been primarily investigated for marriages, and usually ignored for informal unions (cohabitations) and for more complex unions, like marriages preceded by cohabitation. This work aims at assessing how close to (or far apart from) one another these three forms of union just mentioned - direct marriage, marriage preceded by cohabitation, and cohabitation - are with respect to the relationship between union dissolution and childbearing. Then, to study the effect of children on union disruption, several childbearing characteristics are explicitly addressed, to investigate this issue in a comprehensive way, and to tackle some inconclusive results found in the literature. Finally, given that forming a union (marriage or cohabitation) and breaking it, or having children, are decisions that are not taken by a single individual, this study investigates this issue both for men and women.

The second theme focuses on how Tuscan mothers evaluate their experience during pregnancy, at childbirth and in the early postnatal period. Not many national or international sample surveys aim to investigate the experience of pregnant women, contrary to what happens for other care services (cf. e.g. Dowswell et al. 2001; Hundley et al. 2000; Wardle 1994). All these surveys show the importance of women's satisfaction as an indicator of the quality of maternity service, because their satisfaction has positive implications on the health and well-being of both mothers and children (Laurence 1997; Mackey 1995; Simkin 1991; Simkin 1992; Slade et al. 1993; Waldenstrom et al. 1996). Some socio-demographic characteristics seem to influence the woman's satisfaction with respect to the assistance

received, but there is ample disagreement on their role. This work aims to evaluate women's satisfaction, and to analyse the association with some socio-demographic characteristics during the period of gestation, at the delivery, and in the postpartum phase, separately. The multidimensionality of a concept such as satisfaction, which has been often neglected in previous studies, is taken into account, and special attention is paid to the context in which the woman lived, or the hospital in which she gave birth.

This thesis is organized in three sections. The first section (chapters 1 and 2) describes the Italian demographic background beginning from the second half of 20th Century, thus fixing the context and giving some landmarks for the two themes investigated in this work. It describes the changes occurred in Italy after the Second World War and attaining to fertility and family formation practices. The first chapter concentrates on 20th Century, whereas the second one focuses on the decline in fertility and other great demographic transformations occurred beginning from the Nineties, such as the growth of separations and divorces, the drop of marriages, the rise in cohabitations and in children born outside marriage.

The second section is devoted to the first theme, concerning the relationship between fertility and union dissolution in Italy. The first chapter of this part illustrates the literature on this issue. It starts reporting the salient features of the three kinds of union that are investigated: marriage, cohabitation, and marriage subsequent cohabitation. Then, it deepens the relationship between childbearing and union disruption, trying to clarify which aspects could be considered as binding agents of the couple and which ones as disruptive elements, according to the stated literature. Finally, it focuses on the Italian context in terms of family formation practices, fertility, and family legislation. Research hypotheses are outlined in chapter 3, together with a general description of the implemented methodology of analysis. Then, the data used for the analyses are described and accompanied by some descriptive findings, which are useful for interpreting the following results. Chapter 5 concludes with the description of two versions of the implemented model, where the first model specification is formed by four equations, whereas the second one by two equations. Results for both specifications follow in the successive chapter. Models are estimated adding covariates step by step, and a brief discussion about their comparison is given. Finally, chapter 7 concludes the second part with a discussion on the findings of this work, in light of what stated by the literature.

Finally, the third section concerns the second theme, and examines the assessment of the satisfaction of Tuscan mothers. The first chapter of this part illustrates the literature regarding the assessment of health services, in particular of maternity services, the definition of the

model of prenatal care by the World Health Organization, and its implementation by the Tuscany region. Then, the research hypotheses are outlined in chapter 9, together with the two implemented methodologies of analysis. More specifically, the *ecometric* approach, which is a very recent technique to measure characteristics of ecological units on the basis of multiple observations or responses and to estimate higher-level effects, is described in general terms; then, multilevel proportional odds models, which are implemented as second step in the analyses, are outlined. Chapter 10 illustrates the survey, which collected the data used in the analyses, and outlines the main descriptive findings. Then, the following section describes the measurements used in the analyses. Measurements at individual level are the response variables regarding women's satisfaction towards the services during pregnancy, delivery and post-partum. Some of these are used in the first step of the analysis – the ecometric model -, whereas other are used in the second part through multilevel proportional odds models. Instead, measurements at contextual level are indicators derived from the Performance Evaluation System of Health Care of Tuscany region. The following chapter is central, because it describes the analytical strategy implemented for this work. First, the application of ecometric analysis is illustrated for pregnancy and delivery periods, in order to estimate the scale measurements of intermediate satisfaction at the contextual level during each phase; then, the second step of analysis - the estimation of the models for the overall satisfaction during pregnancy, delivery and post-partum periods - is explained. The last two chapters (chapter 12 and 13) conclude the third section. Chapter 12 is devoted to results: it begins with the presentation of the scale measurements obtained by the ecometric models, and continues with the estimated results for the three phases (pregnancy, delivery, and post-partum). Chapter 13 closes the treatise with a general discussion.

First Section

The demographic transformations during the 20th and 21st centuries

CHAPTER 1 THE DEMOGRAPHIC CHANGES OCCURRED IN ITALY DURING THE 20TH CENTURY

1.1 The demographic recovery after the Second World War

At the beginning of the second half of the 20th Century, after the Second World War, Italy had not yet completed the demographic transition that had started nearly one century before. Compared to the Western and Northern European countries, Italy was late: the increase in population, the expansion of life expectancy, the decline in fertility, and the reduction in mortality were all ongoing processes, which would continue until the beginning of the Seventies (Livi Bacci 1998; Livi Bacci 2002).

The demographic characteristics of Italy depended primarily on two factors, which derived from its cultural and historical background: the great regional disparity, and the religious and clerical influence. Also in demographic terms, the large discrepancy between the richer and more modern north and the poorer and old-fashioned south averaged out at the national level. In fact, the northern part of Italy already approached the standards of the Western European countries, while the south lagged behind.

In 1950, there were 47 million Italians. Despite the overall decline in fertility, natality continued to increase, and reached its maximum of over one million births by mid- Sixties. Thanks to the decrease in mortality, ten years after the Italians were about 50 million, and in 1970 they were nearly 54. As a result, during these two decades Italy witnessed a substantial demographic recovery, after the large demographic losses of the war. The expansion of life expectancy was spectacular: from an average of 66.0 years in 1950 it climbed to 72.1 in 1970, above that of Germany (71.0) and the United Kingdom (72.0) (Livi Bacci 2001).

In the Fifties and Sixties Italy went through a period of great transformations, also in demographic terms. During the decade 1950-1959, in the north and centre of Italy, the mean number of children varied from the minimum of 1.62 in Liguria, to the maximum of 2.92 in Trentino Alto-Adige. At the same time, in the south the lowest value was registered for Sicily, with 2.91 children per woman, whereas the maximum was 3.97 in Sardinia. Until 1960, the religious influence in Italian tradition and way of life was evident: the transition to the controlled fertility was only partially adopted. Birth control was widely practised in the north and centre of Italy, whereas the southern part was still at the beginning of the process. At the national level, the number of children per woman, which was approximately 2.30 in

1950-1960, reached 2.55 in 1961-1965, and then started to decline. Nevertheless, the Italian fertility remained above replacement level until 1975, that is much later than other European countries such as United Kingdom, Germany and URSS (Livi Bacci 1998).

The increase in the birth rate until the mid-Sixties was favoured also by the reduction in the mean age at first birth, together with the lowering of the mean age at marriage, because people spent more time as a couple during their reproductive period. Finally, the Italian high birth rate was supported by migration flows, which were consistent in these years both abroad, both within the country. In the two decades after the Second World War, the great pressure given by the high birth rate and the economic growth moved about 2,6 million people abroad, and more than 1,5 million of people internally (Livi Bacci 2001).

Italy was late also in other demographic respects, e.g. infant mortality. While in other European countries, such as United Kingdom and France, the infant mortality rate ranged between 35 and 40 per thousand, Italy still had some 60 deaths per thousand births (Livi Bacci 2001). Great regional disparities persisted: in 1951, in the north and centre of Italy the infant mortality rate was in line with other Western European country such as Germany, but it exceeded 80 per thousand in the south. A decade later, however, infant mortality had dropped to 37 per thousand at the national level (Livi Bacci 1980).

Finally, it is worth remembering that in the Fifties and Sixties the family legislation was old-fashioned about fertility, and even about marriage, separation and divorce. Abortion was prohibited, and the diffusion of information about birth control and family planning was considered as a crime (Livi Bacci 2001). Then, legal separation was rare, and permitted only in extreme cases. Until the end of the Sixties, marriage was (practically) the only accepted way to start a union. This explains why the number of marriages increased until the mid-Sixties; between 1930 and 1970 the mean age at marriage lowered, reaching the minimum of about 24 years for women and approximately 28 for men (Livi Bacci 1980).

1.2 The Seventies: a new era

The last three decades of the 20th century marked a new phase, compared to the great demographic expansion that had characterised the Fifties and Sixties. At the beginning of 1970, the Italian demographic gap with respect to the other European countries had almost disappeared. Infant mortality was still slightly higher than in France, Germany, and the United Kingdom (26 deaths per thousand versus 16, 17, and 21 respectively), but the discrepancy was greatly reduced (Livi Bacci 2001).

From the Seventies to the end of 20th century, several important demographic changes characterised the Italian society: the drop of fertility; the constant decline of mortality; the rapid ageing of the population; the end of out-migrations and the progressive turn of Italy into a country of immigration. Compared to other Western and Northern European countries, Italy showed a more marked decrease in fertility, but a slower increase in separations and divorces, in cohabitations, in the number children born outside marriage, and in one-parent families (Livi Bacci 2001).

During the Sixties, the Italian cultural and religious traditions were undermined by the new feminist movements, and secularised values and orientations started to emerge in the civil society. The general opinion about some debated and thorny issues was changing. Contraception and abortion were no longer taboos, as well as separation and divorce. Even marriage was no longer considered as the *unique* environment where reproduction was admitted, or as the sole possible form of conjugal union. This change of attitude modified the habits that had traditionally governed family formation and reproduction, especially as the practices of birth control spread, with the ensuing reduction in fertility, well below the replacement level (Livi Bacci 2001).

In the decade 1970-1980, even the family legislation followed the new value orientations and attitudes of the Italian society, through the introduction of profound changes that undermined the traditional, catholic vision of the family. In 1970, the divorce law was issued, and then confirmed by a referendum in 1974. Later, in 1987, the five years required by the law to obtain a divorce were reduced to three, thus considerably accelerating the process. A year after the divorce law, the constitutional Court ratified the illegitimacy of the article n. 553 of the penal code, which forbade the campaign in favour of the contraceptive use and in the diffusion of information about family planning. In 1975, the a new family legislation was passed, by which, for instance, children born out of wedlock were no longer discriminated, and, with the abolition of the concept of "pater familias" the two spouses were put on an equal footing. Finally, in 1978 a law that legalized abortion was passed, despite the attempt to repeal it through a popular referendum in 1981 (Livi Bacci 2001).

1.2.1 The drop in fertility

Among the great demographic changes of the last thirty years of the 20th century, probably the most remarkable was the rapid and substantial decline in fertility. The mean number of children lowered consistently beginning from the cohorts born in 1950, and since

1977 the mean number of children per woman has been below two. It touched the minimum of 1.19 in mid Nineties, lower still in the North-Centre - one of the lowest levels in Europe and in the world (Livi Bacci 2001).

As a result, Italy had to face a rapid ageing of its population, which started to cause economic, social and political consequences. Probably as a reaction to the pro-natalist fascist policies, no serious discussion about the consequences of low fertility took place (Livi Bacci 2001).

Among the many factors that concurred to the marked fertility reduction in Italy, three may be mentioned: female education and work, and the changed nature of the family. In the last decades of the 20th century, women's education increased so much that family formation and fertility were postponed. Then, prolonged education might be the sign of less traditional attitudes and identify a contrast between maternity and personal ambitions and aspirations (Lesthaeghe 1995; van de Kaa 1987). Next to education, female participation in the labour market became a central issue. While up to the Sixties the majority of women stayed out of the (formal) labour market, in the following years, female participation in labour market increased, as a means of female emancipation and self-realization. For instance, between 1970 and 1999 the percentage of women belonging to the labour force grew by 70%, whereas the male labour force was approximately stable. In this context, the cost of leaving the labour market, even if only temporarily, increased the cost of children for women (Barber 2001; Dorbritz 2008; Livi Bacci 2001; Willekens 1991). At the same time, family policies that aimed to conciliate family and work did not progress, and neither did the traditional work division between men and women. All these elements concurred to depress fertility.

The third element to be taken into account was family intercourses, especially the relationship between parent and child and the exit from the family of origin. In the last thirty years of the 20th century, children gradually acquired more independence within their families; thus, the cost of leaving the parental family increased during these years. Even more, a prolonged education, the difficulties in entering the labour market, and the cost of living in an independent dwelling favoured a longer stay in the parental "nest". This delayed the formation of stable unions, and the birth of offspring, thus contributing to raise the mean age at marriage and the mean age at first birth (Blossfeld and De Rose 1992; Blossfeld et al. 1995). Compared to many Western and Northern European countries, the late exit from the family of origin was – and still is - an Italian peculiarity. Abroad, welfare states invested more in education, services and activities in favour to the younger, so that they might leave

their households of origin at younger ages, and start their transition to adulthood earlier (Livi Bacci 2001).

Because of the rise in the mean age at marriage and at first birth, fertility expectations might be revised and downsized by young couples. In support of this hypothesis, intentions about parenthood remained largely widespread and oriented towards two children per woman, but the reality of those years was a more restrained fertility (Baldi and Cagiano De Azevedo 1999). Even if the great majority still had children, the only child became a much more common condition than in the past (De Rose and Racioppi 2001).

1.2.2 Separations, divorces and new family formation practices

In the Seventies, separations and divorces were rare events, and family ties appeared still strong. The distance from other European countries was large: the divorce rate amounted to 1.0 per 1,000 inhabitants in Eu-15, whereas in Italy it was only 0.3. Separations and divorces increased slowly until the second half of the Nineties. In 1995, in Italy there were 80 divorces and 158 separations per 1,000 marriages. After this stable period, separations and divorces started to increase rapidly, passing to 104 divorces and 204 separations per 1,000 marriages in 1999 (ISTAT 2004).

Italy remained a country with low divorce rates, compared to other European countries, but the instability of Italian couples was partly masked by the differences in divorce laws. While separation and divorce often coincide abroad, in Italy they do not: a divorce can take place only after three years of legal separation, and several separated partners decided not to divorce (among married partners who legally separated in 1995, only 51% divorced within seven years). Thus, comparing the divorce rate in Eu-15 with the Italian separation rate (1.9 divorce versus 1.3 separations per 1,000 inhabitants, respectively), the distances became shorter (ISTAT 2004).

As for separations and divorces, until the beginning of the Nineties cohabitations, premarital cohabitations, and one-parent families were not widespread in Italy. Premarital cohabitations were short and finalised to marriage; if they did not transform into marriage, they were often second or higher order unions, where people with previous troubled experiences or widows with a means-tested survival pension were involved. During the Nineties, this new family formation practice became more common: from 2% of cohabiting couples at the beginning of the decade to 4% after ten years (Pirani and Vignoli 2015). At the same time, the number of marriages declined, both in absolute and in relative terms, passing from 312 thousands marriages in 1991 to about 280 in 1999 (ISTAT 2014b).

CHAPTER 2 THE RECENT DEMOGRAPHIC TRENDS IN PARTNERSHIP AND FERTILITY BEHAVIOUR

After the completion of the demographic transition, other remarkable family-related demographic changes started to occur in several European countries, such as the decline in fertility, the growth of separations and divorces, the drop of marriages, the rise in cohabitations and in children born outside marriage, the increase in one-parent families. This phase, known as the Second demographic transition (Lesthaeghe 1995; van de Kaa 1987), emerged in Italy in the Seventies, but not all changes had the same pace. Even in this case, Italy showed its historical delay in the diffusion of new demographic events compared to other European countries. While the fertility declined started earlier, the other family-related demographic events began to emerge only in the second half of '90.

2.1 Marriage

Beginning from the Nineties, family formation practices have changed over the last decades in Italy. In 21st century, the number of marriages continued to decline, from about 284,000 in 2000 to nearly 190,000 marriages in 2014, and this in all the regions. Moreover, in the last years the reduction in officiated marriages accelerated, with a loss of 3.8% marriages on average every year from 2008 to 2014.

The decline in the number of marriages primarily concerned first marriages among Italians, which accounted for more than 40 thousands marriages less (corresponding to 76% of missed marriages). The lower propensity to marry was evident: first marriage rates amounted to 421 marriages per 1,000 men and 463 per 1,000 women in 2014, with a decrease of 18.8% and 20.2%, respectively, compared to 2008. This tendency depended on cultural and structural factors. First, the social movements ongoing by some decades have amplified the possibilities of forming a new family, placing cohabitation side by side to the traditional marriage. As a result, several young people chose cohabitation instead of marriage as their first union; sometimes this represented a prelude to marriage, but not always. Even more, a role in the reduction in marriages was played also by the progressive postponement of the timing for family formation. The mean age at first marriage monotonically increased: in 2014, on average men married at the age of 34 years, and women at 31. In just six years, the mean age grew one year for both genders (ISTAT 2015b).

The structural reasons for the reduction of marriages derived from the past natality decisions. Beginning in mid-Seventies, the number of births decreased for more than thirty years in Italy; as a consequence, the population more involved in first unions – namely, people of 16-34 years diminished year by years. The reduced number of Italian young people compared to the previous cohorts justifies the drop of marriages in absolute terms, whereas the end of marriage as the unique family structure explains the fall in relative terms.

Religious marriages declined even more than civil marriages: the proportion of civil marriages passed from 36.8% in 2008 to 43.1% in 2014, when nearly 82 thousands of marriages were officiated with a civil rite. Regional disparities persisted: among first marriages of Italians, 32.3% were celebrated with a civil rite in the North, 36.1% in the Centre, and only 20.1% in the South (ISTAT 2015b).

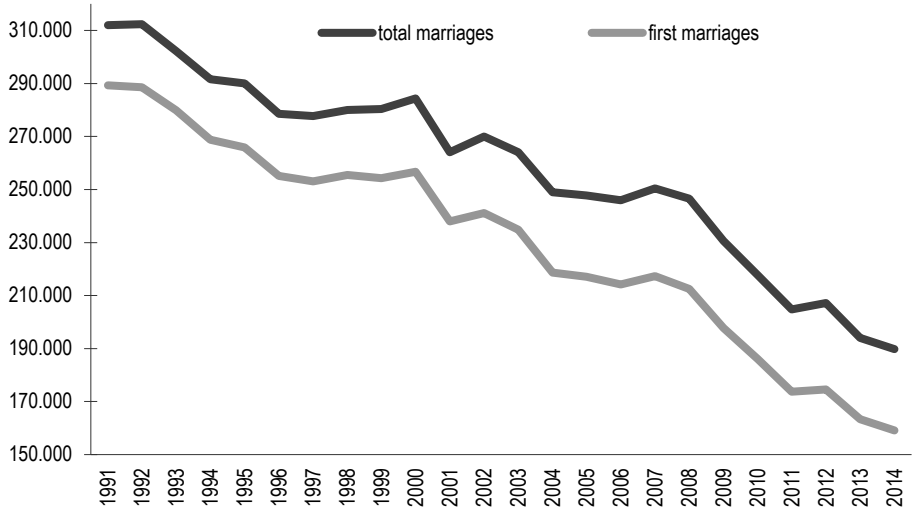
Table 2.1 – Marriages per couple, rite and type of marriage. Absolute and percentage values. 2008, 2011, 2014.

	Couples								
	At least a foreigner			Both Italians			Total		
Type of marriage	Religious	Civil	Total	Religious	Civil	Total	Religious	Civil	Total
				2014					
				ABSOLUTE VALUES					
First marriages	2,976	13,397	16,373	102,583	40,171	142,754	105,559	53,568	159,127
Higher order marriages	298	7,559	7,857	2,197	20,584	22,781	2,495	28,143	30,638
Total	**3,274**	**20,956**	**24,230**	**104,780**	**60,755**	**165,535**	**108,054**	**81,711**	**189,765**
				PERCENTAGE VALUES					
First marriages	18.2	81.8	100.0	71.9	28.1	100.0	66.3	33.7	100.0
Higher order marriages	3.8	96.2	100.0	9.6	90.4	100.0	8.1	91.9	100.0
Total	**13.5**	**86.5**	**100.0**	**63.3**	**36.7**	**100.0**	**56.9**	**43.1**	**100.0**
				2011					
				ABSOLUTE VALUES					
First marriages	3,685	14,702	18,387	118,063	37,332	155,395	121,748	52,034	173,782
Higher order marriages	307	7,923	8,230	2,388	20,430	22,818	2,695	28,353	31,048
Total	**3,992**	**22,625**	**26,617**	**120,451**	**57,762**	**178,213**	**124,443**	**80,387**	**204,830**
				PERCENTAGE VALUES					
First marriages	20.0	80.0	100.0	76.0	24.0	100.0	70.1	29.9	100.0
Higher order marriages	3.7	96.3	100.0	10.5	89.5	100.0	8.7	91.3	100.0
Total	**15.0**	**85.0**	**100.0**	**67.6**	**32.4**	**100.0**	**60.8**	**39.2**	**100.0**
				2008					
				ABSOLUTE VALUES					
First marriages	4,609	22,118	26,727	148,598	37,151	185,749	153,207	59,269	212,476
Higher order marriages	351	9,840	10,191	2,473	21,473	23,946	2,824	31,313	34,137
Total	**4,960**	**31,958**	**36,918**	**151,071**	**58,624**	**209,695**	**156,031**	**90,582**	**246,613**
				PERCENTAGE VALUES					
First marriages	17.2	82.8	100.0	80.0	20.0	100.0	72.1	27.9	100.0
Higher order marriages	3.4	96.6	100.0	10.3	89.7	100.0	8.3	91.7	100.0
Total	**13.4**	**86.6**	**100.0**	**72.0**	**28.0**	**100.0**	**63.3**	**36.7**	**100.0**

Source: ISTAT

Second and higher order marriages represent an important indicator of the diffusion of new family formation practices. In recent years, they increased until 2008, when they started to decline slightly. This phenomenon was partly due to the numerical contraction of divorced people, i.e., those who might remarry. Until the first decade of 21st century, this structural constraint was compensated by the increasing number of divorces, but in recent years this was no longer the case. In 2014, more than 30 thousands marriages were second marriages for at least one of the partner, with a relative decrease of 10% by 2008; at the same time, however, first marriages, declined even more, by 25%. Men remarried more frequently than women, and at older ages (ISTAT 2015b).

Figure 2.1 – Total marriages and first marriages. 1991-2014.

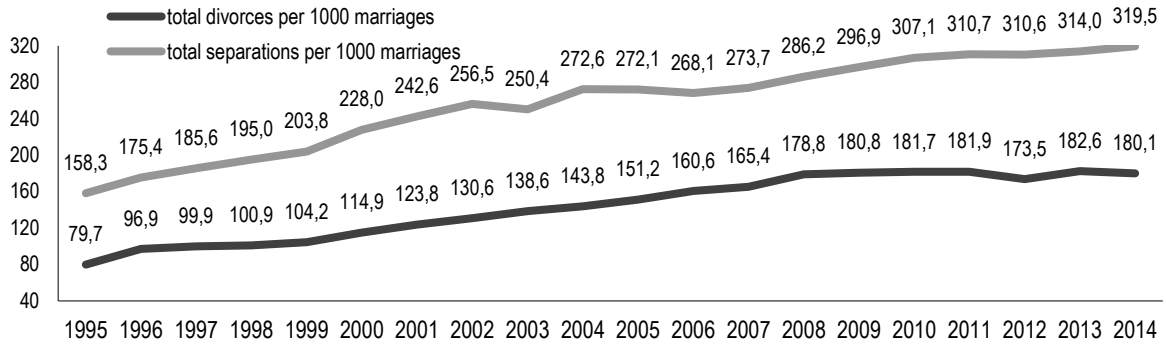


Source: ISTAT

2.2 Separation and divorce

After a long, increasing trend in the number of separations and divorces, in the last years this tendency reduced its speed: in 2014, separations were on average the same as in the fourth preceding years, whereas divorces decreased by about two thousands units compared to 2008. This contraction in the number of separations and divorces had structural, economic, and normative reasons. First, with fewer marriages being celebrated, the number of potential unions to be disrupted by a separation or a divorce diminished. In relative terms, however, the increase persisted: the proportion of marriages dissolved by separation (or divorce) passed from about 115 divorces (and 228 separations) per 1,000 marriages in 2000, to 180 and 315 in 2014, respectively (ISTAT 2004; ISTAT 2015b).

Figure 2.2 – Mean number of separations and divorces per 1,000 marriages. 1995-2014.



Source: ISTAT

Two more reasons explain the slight decline in the number of separations and divorces. Besides, the adverse economic situation probably discouraged the dissolution of marriages, which usually implicates a deterioration of the economic conditions of the families. Finally, from a normative point of view, in the last years Italian citizens more frequently resorted to the dissolution of their marriages in other countries belonging to the European Union[1]. Divorce law of other European countries permits to divorce without having a previous legal separation, and usually requests shorter times and costs than in Italy. In 2015, a new Italian law was promulgated on this topic (Law 2015, n. 55), which reduces the interval between legal separation and divorce from three years to twelve months (if judicial separation), or to six months (in case of consensual separation). As a consequence, in the near future the normative explanation, partly responsible for the slight decline in the number of divorces, should cease to exist. But the recovery of divorces could not happen because of the structural reason, which will persist in the following years.

Separations and divorces continued to have large territorial peculiarities: in the North and Centre of Italy they were widespread, contrary to what happened in the South. Nevertheless, in the last years this discrepancy has shrunk. In 2014, the mean number of separations per 1,000 marriages was over 300 for the majority of Italian regions; the South was between 200 and 300 (Sardinia excluded), and the region of Lazio was over 400 separations per 1,000 marriages (ISTAT 2015b).

Looking at the mean duration of marriage at the time of separation and divorce occurred, in 2014 it was 16.1 years for separation and 18.7 for divorce. As a general tendency, the

[1] The Council regulation n. 2001/2003 concerns jurisdiction and the mutual recognition and enforcement of judgments in matters about marriage and parental responsibility. It ensures that a judgment on divorce proceeding and parental responsibility is recognised and enforced in another Member State through a uniform, simple procedure.

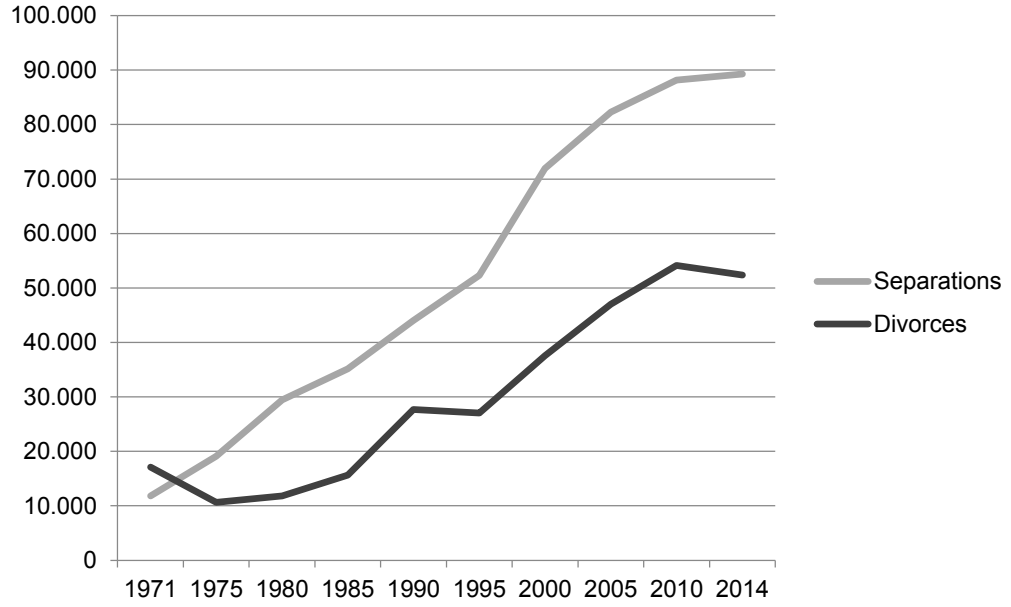
propensity to disrupt a marriage increased and anticipated the event from the older cohorts to the younger cohorts of marriages: fewer marriages survived to dissolution, and more marriages lasted less. Interestingly, the influence of the cohort seemed to be more relevant in the South of Italy, where the younger cohorts of marriage were more inclined to dissolve the union compared to the older ones (ISTAT 2015b).

Differences in the propensity to disrupt a marital union might be observed according to the kind of officiated ceremony, because religious marriages were most stable than civil ones. As an example, after ten years of marriage, 911 religious marriages over 1,000 celebrated in 1995 were still in existence, and this mean value increased to 914 for those celebrated in 2005; instead, civil marriages were 861 for the first cohort, and 841 for the second one. Given the remarkable differences according to the type of rite, the increasing propensity to marital dissolution, and the progressive anticipation of this event could be primarily a consequence of the growing proportion of civil marriages among total officiated marriages (ISTAT 2015b)

Finally, the presence of children within dissolved marriages was remarkable. In 2014, more than 68 thousands separations and 34 thousands divorces concerned couples with children, accounting for 76.2% and 65.4% of total separations and divorces, respectively. Children were under 18 years old in 52.8% of total separations and 32.6% of divorces (ISTAT 2015b).

As a consequence of the increasing number of separations and divorces, new family structures emerged next to families based on marriage, and to those based on cohabitation. Among the new kind of families there were single, not widowed people; lone, not widowed mother; lone, not widowed fathers (rare); conjugated, enlarged families. In a decade, from 1998 to 2009, the percentage of people living in these new family types doubled, accounting for 12 million of people (20% of Italian population) (ISTAT 2011).

Figure 2.3 – Separations and divorces. Absolute values. 1971-2014.



Source: ISTAT

2.3 Cohabitation

Until the beginning of the Nineties, cohabitations and premarital cohabitations were not much widespread in Italian society, and were often second or higher order unions. During the last decade of 20th century, this new family formation practice became more common, even as first union among young Italians (ISTAT 2011). In less than twenty years, unmarried cohabitations increased fourfold, becoming more than one million in 2013-2014 (ISTAT 2015b). Regional differences were marked, because they were much more widespread in the North and Centre of Italy (especially in the North East), and in urban areas. Compared to the past, never married people who enter a cohabitation increased and became the prevailing component, accounting for 641 thousands unions in 2013-2014. According to the socio-demographic characteristics of cohabiting partners and spouses, the first ones were younger (women under 34 years old accounted for 39.8% in 2009, against 12.8% of married women), had a higher educational level, and the female cohabiting partner was more likely employed into the labour market than the spouse. For cohabiting couples, the decision to marry was a choice, instead of a "predetermined" objective as it usually was in the past. This change of mentality explained even the new features of premarital cohabitations, which become more widespread and longer. Between 2004 and 2009, 33% of first marriages were preceded by cohabitation, as well as more than 70% of higher order marriages. The median duration of

premarital cohabitation passed from 2.2 years in 2004 to 2.6 in 2009 among first marriages, whereas it lasted 5 years for second order marriages. Even premarital cohabitations were more widespread in the North and the Centre, where they concerned approximately half marriages during the period 2004-2009 in the North-East and the Centre of Italy; instead, in the South less than 20% of couples lived a premarital cohabitation. Finally, both civil and religious marriages were interested by premarital cohabitation, even if the first ones were more involved, with 50% of civil first marriages preceded by cohabitation against 27% of religious ones in 2004-2009 (ISTAT 2011).

2.4 Fertility

After a minimum of about 526 thousands in 1995, the number of births increased to nearly 577 thousands in 2008, but then declined again. In 2014 they were only 509 thousands, the lowest level reached since 1861 (ISTAT 2014c; ISTAT 2015b).

The increasing trend observed from 1996 and 2008 had three components. The first was a catch-up effect observed among women in their thirties and forties, who had postponed motherhood in their younger years. Indeed, the tendency towards the rise of the mean age at birth contributed to the marked reduction in births from mid Seventies to mid Nineties, and produced a partial recovery in the following years, largely thanks to the baby-boomers. In 2013-2014, the mean age at birth was 31.5, whereas it was under 30 in 1995. Even the age at birth – as all other demographic events presented – had regional disparities, with older mean values in the North and Centre of Italy compared to the South. Even more, the proportion of children born from mothers older than forty, which was negligible in the past, increased: 2.4% in 1995, 4.2% in 2004, and 7.7% in 2013, accounting for nearly 40 thousands births. In 2013 the proportion of births to Italian mothers over 40 exceeded that to Italian mothers under 25 (8.7% and 8.4%, respectively) (ISTAT 2014c).

The second reason was the increase in the foreign resident population, whose fertility was higher (Salvini and Benassi 2011). And the higher proportion of foreigners in the North and Centre of Italy explained the two opposite territorial dynamics of the recovery in fertility, where until 2008 the growth in the number of births registered in the North and Centre of Italy went along with the decline in the South. Indeed, the increase in the number of births in the North and Centre of Italy depended primarily on the growing births to at least one foreign parent. And the last component towards the increase in fertility was given by the emergence of new family types, such as cohabitations and second or higher order unions.

After 2008, a declining tendency was again registered for natality, which might be attributable to two factors, one structural and another economic. The first one is the same pointed out for marriages: the population which is usually fecund (and fertile), namely the 15-49 year population, declined over time because of the reduced number of births occurred from mid Seventies. At the same time, the foreign population was ageing; in 2013 and 2014, even children born to at least a foreign parent started to decline, whereas in 2009-2012 they had continued to increase. The second reason was the economic crisis that discouraged the formation of new unions (ISTAT 2014c).

As for the birth orders, second and higher order births kept on declining, in the North-Centre of Italy as well in the South.

Simultaneously to the diffusion of cohabitation, even marriage lost its prerogative as the unique form of family dedicated to precreation. Children born within a cohabitation become more and more common and increased with a surprising rapidity: in 1999 more than 53 thousands new-borns, corresponding to 10% of births in that year, were born outside marriage; ten years later the percentage had doubled; in 2013 it reached 25.9%, accounting for more than 133 thousands children of unmarried parents. Regional differences persisted: in 2013, in the North and Centre of Italy nearly 30% of children were born outside marriage, whereas in the South and in the two islands the percentage did not exceed 17.7% and 21.5%, respectively (ISTAT 2014c).

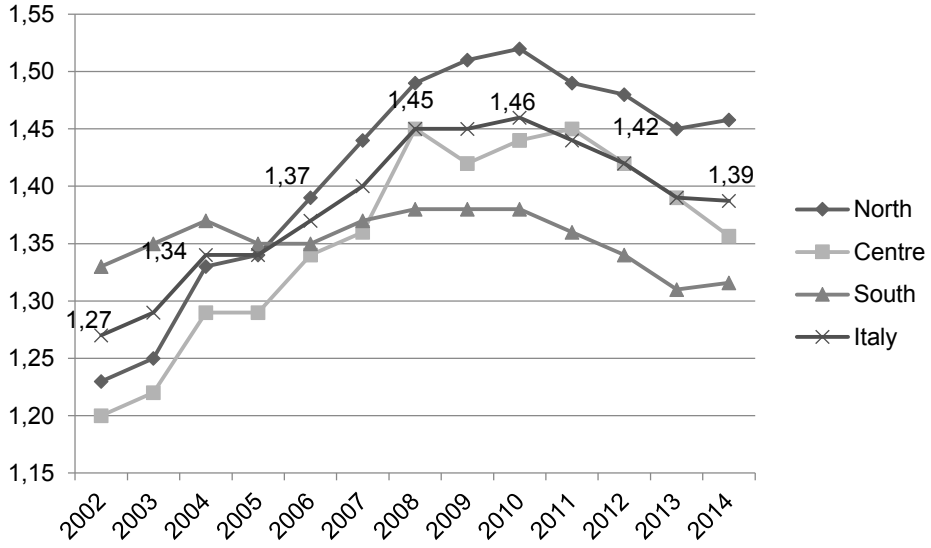
Finally, in 2013 the mean number of children per woman was 1.39, in line with the decline begun in 2010, when the maximum of 1.46 children per woman was reached after the minimum of 1.19 registered in 1995. The higher fertility of foreign women slightly softened the low levels of Italian women, which had on average 1.29 children per woman, whereas migrant women had 2.1 children. Fertility was higher in the North and in the Centre (1.45 and 1.39) than in the South (1.31): this difference depended both on migrant women, and on Italian women. Indeed, in 2013 all southern regions (except Abruzzo) still had a mean number of children lower than the 1995 national level (ISTAT 2014a; ISTAT 2014c).

Table 2.2 – Live births according to gender. 1934-2014.

Live births	Male	Female	Total
1934	508,814	484,152	992,966
1944	419,233	395,513	814,746
1954	446,054	424,635	870,689
1964	522,158	493,962	1,016,120
1974	447,131	421,751	868,882
1984	301,616	284,356	585,972
1994	275,195	257,855	533,050
2004	281,102	265,887	546,989
2014	253,269	238,852	492,121

Source: ISTAT

Figure 2.4 – Total fertility rate (mean number of children per woman) according to the macro-area of residence. 2002-2014.



Source: ISTAT

Second Section

Union dissolution and fertility: Do children act as binding agents or destabilizing actors?

ABSTRACT

Changes in family-related behaviours – such as the growth of cohabitation and divorce, and the decline of fertility - started in Western and Northern Europe in the 1960s. These changes have been largely debated ever since. Among the several demographic variables that may affect union stability, some are related to childbearing, such as the number, age, and (possibly) sex of children, their legal status (biological, adopted, foster or stepchildren) and the timing of their arrival in relation to union formation.

This project focuses on the links between fertility and union dissolution in Italy. Because fertility and union instability are influenced by individual's beliefs and values, childbearing history and partnership career are estimated simultaneously. Forming a union (marriage or cohabitation) and breaking it, or having children, are decisions that are not taken by a single individual. Therefore, this project investigates the relationship between fertility and union dissolution both for men and women, paying attention to gender differences.

INTRODUCTION

Notable changes in family-related behaviours started to emerge in Western and Northern Europe in the early 1960s (Lesthaeghe 1992; van de Kaa 1987). Cohabitation rose whereas direct marriage decreased, and the number of marriages ending in divorce grew. Even if the intensity and the pace of the change varied considerably among countries, these changes generally intensified in the nineties, and accelerated in the first decade of the twenty-first century.

Next to family formation changes, Western and Northern European societies lived also a marked fertility decline that got underway in the late 1960s and early 1970s (Frejka et al. 2008). In most European countries, women had fewer children, and at later ages, until the beginning of the 21st century (Frejka and Sobotka 2008; Kohler, Billari and Ortega 2002; Sobotka 2004).

In Italy, the diffusion of new family behaviours started later, in the early eighties. Marriage dissolution is now a pervasive phenomenon, with 320 separations and 180 divorces per 1,000 marriages in 2014 (ISTAT 2015b). Informal unions and non-marital fertility have gained relevance: cohabiting unions were more than one million in 2013-2014, and 25.9% of births were out-of-wedlock in 2013. Fertility decline started earlier, in the second half of the 1970s, and was very marked: in the mid-nineties, the minimum of 1.19 children per woman was reached. A slight recovery brought fertility back up to 1.39 children per woman in 2014 (ISTAT 2014a; ISTAT 2015b).

Marital dissolution, and, more recently, union dissolution in general, have been extensively studied (Lyngstad and Jalovaara 2010). Among the several demographic features that might affect it, some are related to childbearing, such as the number, age, and (possibly) sex of children, their legal status (biological, adopted, foster or stepchildren) and the timing of their birth in relation to union formation (e.g., Andersson 1997; Waite and Lillard 1991).

This study addressed the instability of romantic, co-residential relationships, and focused on fertility and union dissolution in Italy. Since fertility and union instability are both influenced by individual's beliefs and values, childbearing history and partnership career needed to be estimated simultaneously (Coppola and Di Cesare 2008; Lillard and Waite 1993). Forming a union (marriage or cohabitation) and breaking it, or having children, are decisions that are not taken by a single individual. Therefore, this study investigated the

relationship between fertility and union dissolution both for men and women, paying attention to gender differences.

CHAPTER 3 THE INFLUENCE OF CHILDREN ON UNION DISSOLUTION

3.1 Marriage, cohabitation and premarital cohabitation

In the last decades, notable changes in family-related behaviours have emerged in Europe (Lesthaeghe 1992; van de Kaa 1987). Couples have formed not only through marriage, but also, and increasingly so, through cohabitation. Next to cohabiters and married couples, in recent years another category of partners has emerged: those who first cohabited and then married.

It is well know that cohabitation is a less stable and long-lasting union than marriage (e.g., Booth and Johnsonn 1988). Conceptual models of family change provide contrasting views on how we might expect the stability of cohabiting families to change over time. A cultural explanation, deriving from the Second Demographic Transition (SDT), looks at cohabiting couples as less traditional people, who are less likely to accept normative marital behaviours, have lower commitment to the union, and have more secularised values (van de Kaa 1987). In this vein, cohabiting partners are more likely to break a union if it no longer fits their personal desires and feelings. But this effect is arguably diluting over time: especially in countries where cohabitation is increasingly widespread, this form of union should become more normative, childbearing in cohabitation should become more common and cohabiting families should become more stable (Kiernan 2000; Kiernan 2002; van de Kaa 1987). In this vein, cohabiting partners look increasingly like married couples over time (Pirani and Vignoli 2015). Consistent with this notion, childbearing within cohabitation has increased across Europe since the 1970s, and transitions to marriage among cohabiters have declined (Bumpass and Lu 2000; Guzzo 2014; Kennedy and Bumpass 2008; Kennedy and Bumpass 2011; Lichter, Qian and Mellott 2006; Perelli-Harris et al. 2014).

A contrasting view points to the increasingly privileged position of marriage relative to cohabitation, and suggests growing differences in the stability of married and cohabiting families (Cherlin 2009; Furstenberg 1996). This theory draws on the social status accorded to married couples, looking at marriage as a marker of prestige that requests substantial economic prerequisites (Carlson, McLanahan and England 2004; Edin and Kefalas 2005; Gibson-Davis 2009; Gibson-Davis, Edin and McLanahan 2005; Smock, Manning and Porter 2005). As for the second demographic transition theory, some empirical validations, which

emphasise the link between economic position and partnership choice, support this hypothesis. Despite the increase in fertility among cohabiting couples, the experience of marital and cohabiting families may remain distinct, and potentially diverge over time. Cohabitation may remain a less-stable form of union, and grow less stable over time relative to marriage.

The majority of studies places indirect marriages some way in between cohabitations and marriages, in terms of resiliency (Berrington and Diamond 1999; Hoem and Hoem 1992; Teachman and Polonko 1990) - but much depends on how things are measured. Premarital cohabiting partners should in principle have a lower divorce risk, because of a "trial marriage" effect, by which only the most stable and well-assorted cohabiting unions transform into marriages (Bennett, Blanc and Bloom 1988; Cherlin 1981; Teachman, Thomas and Paasch 1991). Nevertheless, the empirical evidence does not support this hypothesis, and rather leans towards a "self-selection" effect, according to which the divorce risk is higher after premarital cohabitation (De Rose 1990; Impicciatore and Billari 2012). Since those who (first) cohabit are less attached to religion or have less conventional attitudes about marriage, they also tend to dissolve an unsatisfying union more easily than those who marry directly (Berrington and Diamond 1999; Hoem and Hoem 1992; Teachman and Polonko 1990). In order to control for the unobserved characteristics of cohabiters and non-cohabiters, a few statistically refined studies tried to jointly model union formation and union dissolution, but even in this case no concluding result emerged (Kulu and Boyle 2010; Lillard, Brien and Waite 1995; Svarer 2004).

3.2 Instability and childbearing within the union

In the specialised literature, the relationship between childbearing and union dissolution has been analysed from different perspectives. Several theories try to explain this association through different explanations, but they all agree on the greater stability of unions with children, compared to those without children. According to the economic perspective, children are an example of union-specific capital, because the benefits gained from having children are bigger when parents live together (Becker, Landes and Michael 1977). In social psychology, children are seen as a form of joint production increasing the partners' commitment to the union (Brines and Joyner 1999). Nevertheless, the most prominent justification for the lower risk of union dissolution for couples with children is a selection effect: individuals oriented towards family values are more likely to keep a stable and

satisfactory relationship and to have children; conversely, partners who are less committed to the continuity of their union are also less likely to have children (Becker 1996; Lesthaeghe and Moors 2000).

Empirically, however, the impact of childbearing on union dissolution needs some clarifications. First, the type of union matters. In the existing literature, it is well recognized the binding effect that children have on both marriages and cohabitations. For cohabiting couples, however, the relationship between fertility and separations is more complex than for married partners, because data are often lacking, and selection plays an even stronger role: non-married couples are few (and very peculiar) in some countries, and common in others. The same holds for childbearing within a cohabitation (Sobotka and Toulemon 2008). Cohabiting couples with children express high hopes that their relationships will last (Gibson-Davis, Edin and McLanahan 2005; Waller 2001) and experience higher emotional distress following separation than those without children (Tavares and Aassve 2013). Further, couples with children are of particular concern from a policy perspective given that parental separation directly affects the children's living arrangements and the resources available to them (Tach and Eads 2015; Tach, Mincy and Edin 2010). Nevertheless, in the specialised literature cohabitations emerge as less resilient than marriage even if there are children (Andersson 2002; Berrington 2001; Jensen and Clausen 2003; Manning, Smock and Majumdar 2004; Raley and Wildsmith 2004; Tach and Edin 2013; Wu and Musick 2008). Even couples who were cohabiting at birth and subsequently married appear more stable than those who remained cohabiting (Manning, Smock and Majumdar 2004; Wu and Musick 2008).

The influence of other aspects of childbearing on union dissolution have been primarily investigated for marriages, and usually ignored for informal unions (cohabitations) and for more complex unions, like marriages preceded by cohabitation.

According to some studies, the presence of children consolidates the marriage and reduces the risk of divorce (Andersson 1997; Hoem and Hoem 1992). Others, instead, argue that the connection should be qualified. For the United States, Lillard and Waite (1993) found a lower risk of divorce associated with the first child, whereas higher order children had the opposite effect. The same result is confirmed for Denmark (Svarer and Verner 2006), but not in Italy and Spain where second or higher order births apparently decrease the risk of union dissolution (Coppola and Di Cesare 2008; De Rose 1990). Controlling for birth order, twins do not seem to have an impact on divorce rates, compared with two singletons (Walke 2002).

Children's age too impacts on the risk of union dissolution, which is lowest when they are young, but rises again as they grow older (Andersson 1997; Steele et al. 2005; Waite and Lillard 1991). The sex composition of children may be important too (Andersson et al. 2006). Morgan et al. (1988) supported this hypothesis for the United States, finding a lower divorce risk for couples who had only male children than for those who had only girls. Nevertheless, European studies, as well as a comparative research including US, did not corroborate this hypothesis (Andersson and Woldemicael 2001; Diekmann and Schmidheiny 2004).

As for the timing of childbearing, the general expectation is that longer first-birth intervals (i.e. between marriage and first birth) may promote marital stability by giving the couple the necessary time to develop strong interpersonal ties before the arrival of the child. Besides, delaying the first birth allows the couple to become more financially secure, reducing economic pressure, which is one of the main sources of marital tension. But the limited amount of empirical research on the effects of timing has produced inconsistent results thus far. Morgan and Rindfuss (1985) found that delaying births within marriage did not increase the stabilizing effect of parenthood, whereas, according to Christensen and Meissner (1953) and Christensen (1963), divorces are less likely for those with longer first-birth intervals.

The presence of children from previous relationships, namely stepchildren, has also risen, especially among cohabiting partners (Carlson and Furstenberg 2006; Guzzo and Furstenberg 2007a; Guzzo and Furstenberg 2007b; Tach and Edin 2013; Thomson et al. 2014). Empirical findings suggest that growing family complexity may lead to greater instability, both for cohabitations and marriages. Indeed, the presence of one or more stepchildren may constitute a source of tension and discord, increasing the dissolution risk of remarriages (Lichter and Qian 2008; Martin and Bumpass 1989; Sweeney 2010; Teachman 2002; Teachman 2003; White and Booth 1985), or may be associated with union dissolution among unmarried parents (Carlson, McLanahan and England 2004; Lichter, Qian and Mellott 2006; Manlove et al. 2012a; Manlove et al. 2012b; Osborne, Manning and Smock 2007; Tach and Edin 2013). Nevertheless, the increased risk may depend on who experimented previous childbearing within the couple: Teachman (2008) argued that it is associated only with women bringing their own stepchildren into the second marriage. Even in this case, the effect seems to be associated with the timing, increasing the divorce risk within five years since marriage, and waning after that period, thus suggesting that the problems and stress created by stepchildren diminish over time (Wineberg 1992).

The timing of the transition to parenthood in relation to both cohabitation and marriage

may be important, too. Even if there is agreement about the higher risk of union dissolution for cohabiting parents with children, compared to married ones (e.g., Manning, Smock and Majumdar 2004), premarital cohabiters may be distinguished in two groups: those who cohabited, got married, and then had a child, and those who cohabited, had a child, and finally got married. Wu and Musick (2008) suggested two possible hypotheses about the stability of these kinds of couples. The first one points out that the ordering of cohabitation, marriage, and childbearing affects the union stability, because cohabiters who have a birth prior to marriage may be a selected group with less traditional attitudes about the family, and thus be associated with a higher union instability. The second hypothesis holds that the timing of childbearing within cohabitation or marriage does not matter, because many cohabiters plan their births, and marriage may be the consequence of a decision made jointly with childbearing. In their work, they found that among cohabiters who married, there was no association between the timing of marriage relative to childbirth and union stability. Nevertheless, a handful of studies have investigated the association between relationship stability and union transitions around the time of a birth. Rackin and Gibson-Davis (2012) similarly found little difference in stability between couples entering marriage before and after conceiving their first child. Finally, according to Musick and Michelmore (2015), who explicitly accounted for this issue, the timing of a first birth relative to marriage does not appear to be significantly associated with their risk of dissolution: the risk of dissolution is statistically indistinguishable for couples who have a birth in marriage without ever cohabiting, those who cohabit and then have a birth in marriage, and those who have a birth in cohabitation and then marry. These findings suggest that many of these cohabiting couples jointly plan marriage and childbirth. After all, if cohabiters' decisions to marry were driven primarily by accidental pregnancies and practical issues around co-parenting, the ordering of marriage and childbirth would presumably matter more (e.g., Reed 2006).

3.3 Fertility, marital dissolution, and cohabitation in Italy

In Italy, the diffusion of new family behaviours started later than in the rest of Western and Northern Europe, where the main changes began in the early 1960s (Lesthaeghe 1992; van de Kaa 1987). In Italy, the first transformation regarded fertility, which started to decline in the mid-sixties. The drop was unexpectedly fast, and reached alarming values by mid-nineties. A slight recovery thereafter, followed by modest oscillations, brought fertility to its current level of 1.39 children per woman (ISTAT 2015a).

The decline in Italian women's fertility depends primarily on the drop of second and higher order births. First and second order fertility rates increased for the cohorts born until the mid 1940s, and then they declined. For instance, the first order fertility rate equalled 0.89 for the birth cohort of 1950 and 0.78 for the birth cohort of 1970; the second-order rate was 0.66 and 0.53, respectively; and the third-order one collapsed to 0.36 and 0.14 between 1950 and 1970 (ISTAT 2014a).

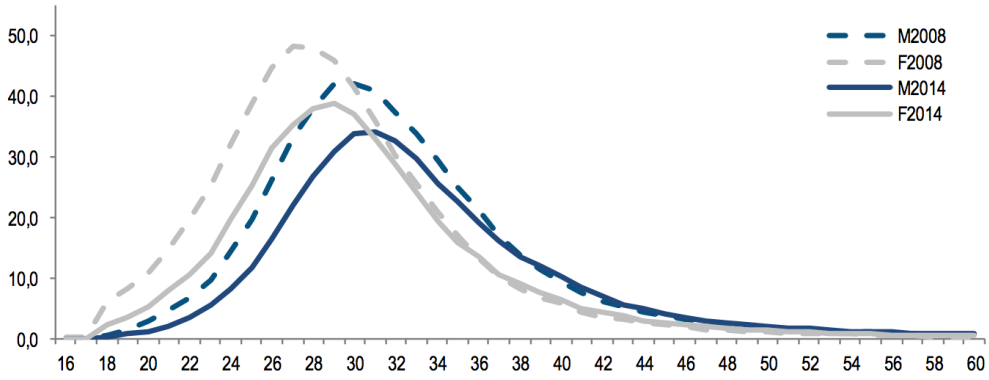
One of the main drivers of the fall in the number of children per woman has been the rise in the mean age at birth, because fertility intentions tend to be revised downwards with age for several reasons (Iacovou and Tavares 2011), fecundity problems can emerge at relatively late ages (Letherby 1999). In short, women had fewer children and at later ages.

The other notable changes in family formation practices started some years later, in the early eighties. Then, these transformations intensified in the nineties, and accelerated in the first decade of the twenty-first century. The main processes observed during this period were the marked drop in the number of marriages and the increase in marital instability, as a consequence of the secularisation of family behaviours.

In the decade 1970-1980, the family legislation prepared the ground for the rise in marital dissolution, with the promulgation of the divorce law. Another important change occurred in 1987, when the five years required by the law to obtain a divorce were reduced to three, thus accelerating the process.

In the seventies, marriages started to decrease, especially between mid '70 and mid '80. The most remarkable changes have been the rise in the mean age at marriage, the drop in first marriages and the rise in second and higher order marriages, the increase in civil marriages. In the mid 1970s, women married at about 24 years, and men at about 28; after 40 years, the increase in the mean age at first marriage has been remarkable, about 7 years for women and 6 years for men (Fraboni et al. 2007; ISTAT 2015b).

Figure 3.1 – First marriage rates according to gender and age. 2008, 2014.

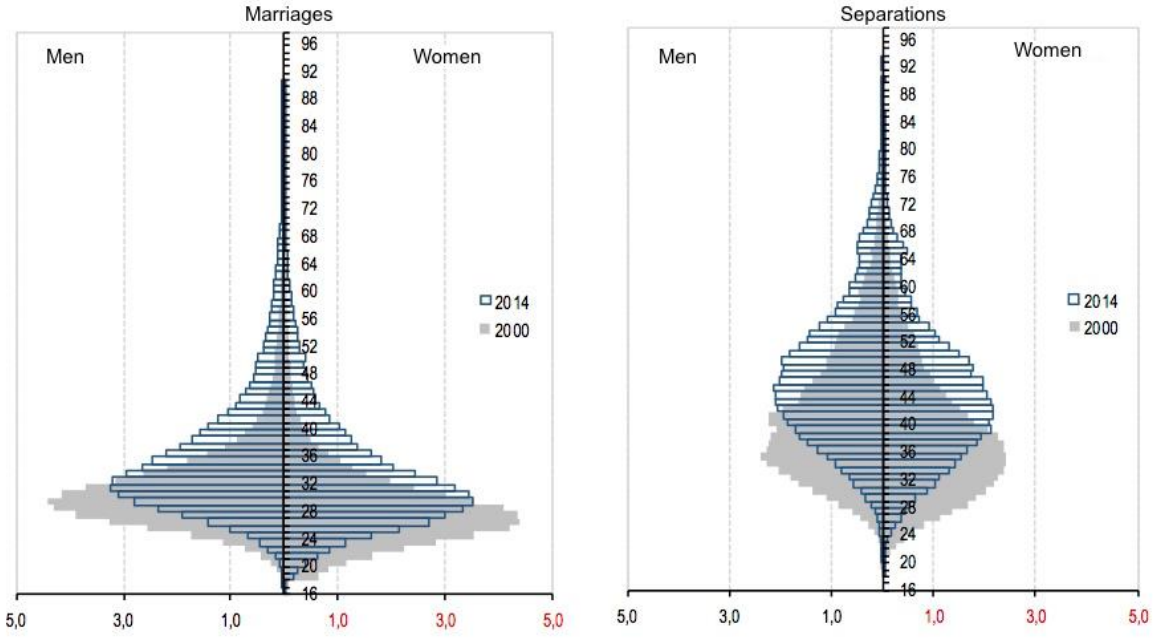


Source: ISTAT (2015b)

Next to the drop in marriages, the number of marriages ending in divorce has grown, thus reducing on the whole the number of people who live within a marriage. In 1980 there were approximately 29,400 separations and 11,800 divorces; thirty years after, separations were nearly three times at high, and divorce four times and a half.

Concentrating on the timing of marital dissolutions, in the last twenty years the interruption of the union increasingly involved long-lasting marriages, whereas the absolute number of marriages disrupted within five years remained nearly the same. In 2014, the mean duration of marriage at separation was 16.1 years and that at divorce was 18.7; when separation occurred, husbands were 47 years old on average, and wives 44. For both genders, the median age class was 40-44 years, whereas in 2000 it was five years younger, confirming the rise in disrupting long-lasting marriages over the last years. Finally, men over 40 years old who separated in 2000 were 48% and in 2014 they were 77%; for women these figures are 38% and 65% respectively. This raising process of the age at separation depends on two elements: the greater propensity to dissolve long-lasting marriages; and the progressive ageing of the married, due to marriage postponement.

Figure 3.2 – Age pyramid for marriages and separations (% values). Men and women. 2000, 2014.



Source: ISTAT (2015b)

The presence of children within dissolved marriages was remarkable. In 2014, more than 68 thousands separations and 34 thousands divorces concerned couples with children, accounting for 76.2% and 65.4% of the total. Children were under 18 years old in 52.8% of total separations and 32.6% of divorces (ISTAT 2015b).

Table 3.1 –Marriages, separations and divorces. 2008-2014.

	2008	2010	2012	2013	2014
Total marriages (abs.v.)	246,613	217,700	207,138	194,057	189,765
Variation compared to the previous year (%)	-1.5	-5.6	1.1	-6.3	-2.2
With both Italian spouses					
First marriages (abs.v.)	185,749	168,610	153,311	145,571	142,754
Variation compared to the previous year (%)	-3.5	-3.7	-1.3	-5.0	-1.9
With at least a foreign spouse					
All order marriages (abs.v.)	36,918	25,082	30,724	26,080	24,230
Variation compared to the previous year (%)	6.8	-21.8	15.4	-15.1	-7.1
Civil marriages (abs.v.)					
Civil marriages (abs.v.)	90,641	79,501	84,841	82,512	81,711
Civil marriages per 100 total marriages	36.8	36.5	41.0	42.5	43.1
First marriage rate (per 1,000 men)	518.1	461.9	460.0	431.6	421.1
First marriage rate (per 1,000 women)	580.4	516.6	506.9	475.5	463.4
Separations (abs.v.)	84,165	88,191	88,288	88,886	89,303
Variation compared to the previous year (%)	3.4	2.6	-0.6	0.7	0.5
Separations per 1,000 marriages	286.2	307.1	310.6	314	319.5
Separations with children under 18 (%)	52.3	49.4	48.7	51.9	52.8
Divorces (abs.v.)	54,351	54,160	51,319	52,943	52,355
Variation compared to the previous year (%)	7.3	-0.6	-4.6	3.2	-1.1
Divorces per 1,000 marriages	178.8	181.7	173.5	182.6	180.1
Divorces with children under 18 (%)	37.4	33.1	33.1	34.8	32.6

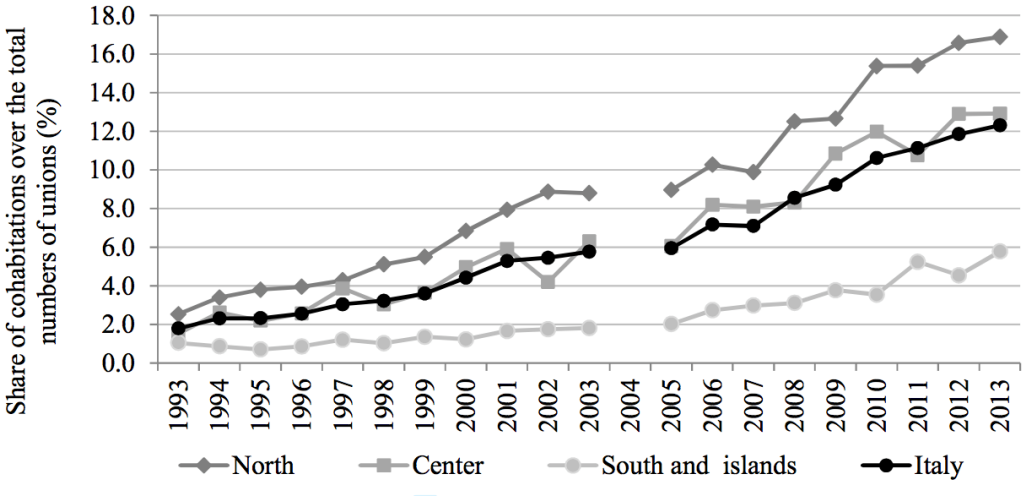
Source: ISTAT

Next to the rise in marital dissolutions, the other most remarkable consequence of the secularisation of family behaviours was the increase in informal unions during the nineties.

During the eighties, most young people had a positive attitude towards informal unions as a first union, but the great majority of them thought that the social context was not culturally prepared to accept it (Barbagli, Castiglioni and Dalla Zuanna 2003; Rosina and Fraboni 2004). As a consequence, during the first half of the 1990s, cohabitations were still rare, whereas they were much more widespread in Northern and Western European countries. Then, unmarried cohabitations rose very rapidly, passing from 2% in mid ’90 to 12% in 2013 (Pirani and Vignoli 2015).

Nevertheless, the spread in cohabitation does not seem necessarily implicate a rejection of marriage, even for the youngest. The proportion of married young people among those who cohabited as first union supported this hypothesis, as well as some recent surveys about opinions and attitudes around this argument (Fraboni et al. 2007). Despite this, the proportion of people who started to cohabit without thinking to marry in the future has grown, as well as their duration of cohabitation and their fertility: in 1999 53,500 new-borns, corresponding to 10% of births in that year, were born outside marriage; ten years later the percentage doubled; in 2013, 25.9% of births were out-of-wedlock (ISTAT 2014c).

Figure 3.3 – Diffusion of cohabitation in Italy and Italian macroarea. Individuals aged 18-49 (%). Italy. 1993-2013.



Source: Pirani and Vignoli (2015)

CHAPTER 4 RESEARCH QUESTIONS AND METHODS

4.1 Research questions

The literature review has illustrated some associations between childbearing and union dissolution, which have already been tested and discussed. Nevertheless, some aspects need a clarification, while others have not been investigated yet. Let us try to summarize the research questions that still remain unanswered. First, the majority of studies points out that cohabiting couples are more likely to disrupt a union than married ones, but they substantially ignore the presence of children in the couple. This issue has not yet been dealt with, and needs to be investigated (e.g., Amato 2010). Does the presence of children act as a binding agent? Does it affect cohabiting and married couples in the same sense? And what about those who marry after premarital cohabitation?

Second, many demographic characteristics, which may affect the association between childbearing and marital disruption, have already been tested and identified in the literature. But what about their influence on cohabitation and indirect marriage? Is there any factor - such as the number, age, and sex of children, their legal status (biological, adopted, foster or stepchildren) and the timing of their birth in relation to union formation - that can affect the stability of cohabitations and indirect marriages too? Do they have the same direction and magnitude in comparison to marriages? Little is known about these associations, which still need to be addressed in the literature.

Third, what about premarital cohabiting couples who had children before or after marriage? Do they differ in their risk of union dissolution? According to previous research with US data (Musick and Michelmore 2015; Wu and Musick 2008), the risk of separation does not diverge significantly, but what happens when we look at a more traditional country like Italy?

And, fourth, is there gender specificity? Is there any demographic characteristic that may affect the association between childbearing and union disruption differently (i.e. the sex of children or their legal status) according to a gender perspective?

The aim of this study was to assess the relationship between union dissolution and childbearing, trying to answer all these pending questions. Union dissolution and fertility were treated as parallel careers through the application of simultaneous hazard models (e.g., Lillard 1993), keeping both selection and endogeneity under control. Selection was accounted

for by modelling separately the different types of union (direct marriage, indirect marriage and cohabitation), because partners might have specific value orientation, aspirations and motivations. Besides, the standard applications of event-history techniques ignore that several life courses - such as partnership and fertility careers - develop in parallel over time (Aassve et al. 2006), and the decisions about different family spheres are made simultaneously (Matysiak and Vignoli 2013). This implies that family trajectories were likely to be jointly determined by a set of endogenous factors, and that the outcomes of the two processes under observation - fertility and partnership in this case - might affect each other directly. Multi-process hazard models should be used to account for these unobserved characteristics.

This work aimed at assessing how close to (or far apart from) one another these three forms of union (direct marriage, indirect marriage and cohabitation) were with respect to the relationship between union dissolution and childbearing. In all cases, "dissolution" here means the "de facto" separation, which in Italy might precede the legal separation - or even substitute it (Amato 2010).

Forming a union (marriage or cohabitation), having children, and breaking a union are decisions that are taken not by a single individual, but by both partners. Therefore the life-course of both partners may help to explain the final outcome (Coppola and Di Cesare 2008). This is why this project investigated the relationship between fertility and union dissolution for both genders. Moreover, the association between fertility and union dissolution could be different for men and women; this hypothesis justified a separate modelling strategy for the two genders.

Finally, appropriate analytical treatment of union dissolution and fertility transitions involved three interrelated dimensions: the occurrence or non-occurrence of an event, the timing of that event, and the sequencing of that event compared to other events. Specifically, focusing on the impact of children on union dissolution, we concentrated on both the occurrence, the number and the timing of childbearing in relation to union instability, because several studies point out the influence of both elements on union dissolution (e.g., Andersson 1997; Hoem and Hoem 1992; Lillard and Waite 1993; Waite and Lillard 1991). Then, to study the effect of children on union disruption, also the status of children - another well-known factor associated with union dissolution - was explicitly addressed, looking at the presence of biological children, adopted/foster children, and stepchildren (e.g., Teachman 2008; White and Booth 1985; Wineberg 1992). Finally, two other childbearing characteristics were considered: the children's gender and the birth of children during premarital cohabitation for indirect marriages, in order to assess if their lack of influence on the stability

of the relationship found in previous studies was confirmed (Andersson and Woldemicael 2001; Diekmann and Schmidheiny 2004).

4.2 Multi-process event-history analysis

For this study, we applied an event-history analysis (EHA) in its multi-process version.

Event-history analysis is a very useful technique when the researcher is interested in the occurrence of an event, given that this event may occur at any point in time (possibly, in a pre-set time frame), and that it may be influenced by time-constant or time-varying variables, or both. This method has often been applied to the study of family-related events, such as marriage, births, and so forth (Lillard, Brien and Waite 1995). Event-history analysis is mostly applied when the data are collected retrospectively via life history studies, covering the whole life course of individuals.

The event-history analysis is a model of duration (or a hazard model), because the outcome of interest is the duration until the occurrence of an event. It allows researchers to "follow" individuals over time, and to catch the occurrence or non-occurrence of the event under study, taking into account several explanatory variables, beyond time itself. It is possible to introduce time-varying covariates, and to allow for individuals with periods of observation of varying length.

The outcome of interest of an EHA is the hazard (or transition) rate of occurrence of the event under study, where the hazard at time t is the probability density of the occurrence of that event at time t, given that it had not taken place before:

$$h(t) = \lim_{\Delta t \to 0} \frac{Pr(t \leq T < t + \Delta t | T \geq t)}{\Delta t}$$

If the event of interest is first marriage, and the purpose is to study the transition to the first marriage, the model estimates the hazard rate of first marriage. The central idea is to express the hazard rate, which describes a process evolving over time, as a function of time *t* and a set of covariates, *X*, observed up to time *t*:

$$h(t) = g(t, X)$$

The function *g(.)* may be specified in several different ways. The general expression of a transitional hazard model is the following:

$$\ln\big(h(t|X)\big) = \ln\big(h_0(t)\big) + \beta X$$

where the hazard rate is assumed to depend on time *t* through the baseline hazard rate $h_0(t)$ and on a set of explanatory variables *X*, where the covariates influence the log-hazard

additively.

Event-history models may introduce different assumptions on the shape of the baseline hazard. In EHA, the simplest transition rate model is the exponential version, which assumes that the duration variable *T* assumes an exponential distribution with hazard rate $h(t) = a = \exp(\alpha)$. Thus, in the exponential model the transition rate is time constant. The time invariant assumption of the transition rate makes this model very easy to deal with, but it does not allow any flexibility, and it proves unrealistic, because in most cases, the assumption that the forces of change are constant over time is not theoretically justified. It is therefore important for an appropriate modelling of social processes to be able to include time-dependent covariates in transition rate models.

The piecewise constant exponential model, a simple generalization of the standard exponential model, proves extremely useful in many practical research situations. In this model, the baseline hazard is modelled through a piecewise constant function:

$$h_0(t) = \begin{cases} h_1 \;\; t \in]0, \tau_1] \\ h_2 \;\; t \in]\tau_1, \tau_2] \\ \quad \ldots \\ h_j \;\; t \in \left]\tau_{j-1}, \infty\right] \end{cases}$$

where the transition rates are constant within each interval, but not necessarily so between them.

Finally, a very flexible function for the baseline hazard duration is the piecewise-linear spline (or generalized Gompertz). The piecewise-linear spline specification has the great merit to allow researchers shape several different patterns, and properly represent even non-proportional hazards. All these three baseline hazards – constant, piecewise constant, and piecewise linear spline – fall within the category of proportional hazard models, because if the covariates included in the models are time constant, they shift the hazard up or down proportionally at each time point. In this model, the baseline hazard duration has the form:

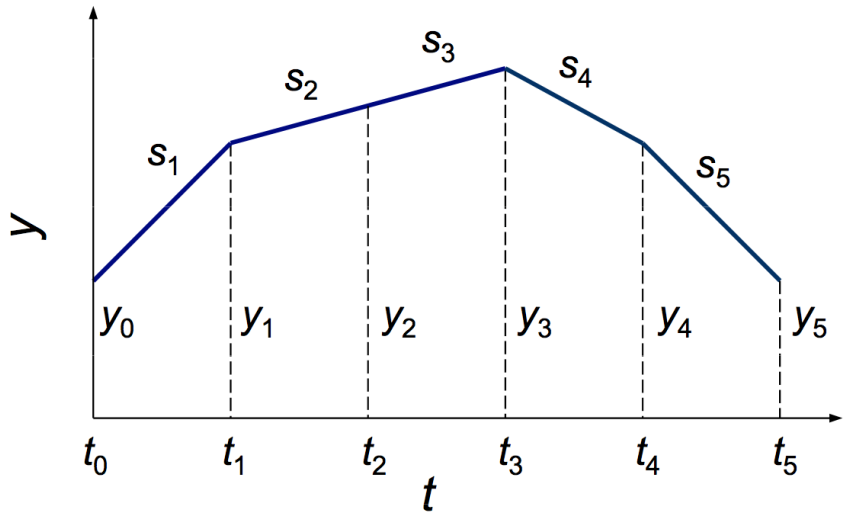
$$\ln\big(h_0(t)\big) = y_0 + \textstyle\sum_k s_{k+1} y_k(t),$$

where

$$y_k(t) = \begin{cases} 0 & t < t_k \\ t - t_k & t_k \le t < t_{k+1} \\ t_{k+1} - t_k & t \ge t_{k+1} \end{cases} \quad k = 0,1,2, \ldots$$

The number of nodes determines the flexibility of the baseline hazard in adjusting its behaviour to the process to be modelled (see Figure 4.1 for an example with five nodes).

Figure 4.1 – Piecewise liner spline of a baseline hazard duration.



Another extension in the classical proportional hazard model consists in the inclusion of a heterogeneity term. The problem of individual, unobserved heterogeneity is common to all regression models, but its effects can be more serious in EHA, because unobserved heterogeneity biases parameter estimates even if the variables that would account for heterogeneity are uncorrelated with the explanatory variables included in the model. As a consequence, the hazard depends more heavily on time. To solve this problem, an error term may be included in the hazard model to take into account the presence of unobserved variables that may alter the risk of occurrence of the event under observation. In this case, the model takes the form:

$$h(t) = h(t|X = 0)\exp(\beta X + \varepsilon)$$

The error term ε represents the individual propensity to experiment that event, after all the other factors have been taken into account. In order to identify the model, a probability distribution needs to be specified for the heterogeneity term. The most usual is the time-invariant, normality assumption:

$$\varepsilon \sim N(0; \sigma^2)$$

When analysing the risk that an event occurs, due consideration must be paid to the fact that most demographic events may be repeated over time: marriage (not first marriage) is an example, because people may marry more than once in their life. In the analysis of repeated events, one needs to take into account the correlation existing between the spells of the same person (the correlation existing between trajectories of first and second marriage for the same subject, for example)

Finally, two or more outcomes may be analysed simultaneously through a multi-process hazard model. Several family trajectories, such as partnership and fertility, develop in parallel over time (Aassve et al. 2006) and are likely to be jointly determined; in this case, the outcomes of the processes under observation may affect each other directly. With multi-process hazard models joint parameter estimate is possible, which avoids a possible source of bias: that which occurs when one ignores the effect of an outcome - i.e., the transition to an event - on the risk of occurrence of the other. The comparison of a separate estimation of two or more processes with a joint estimation of the same processes normally shows that the estimated coefficients may differ substantially; if this happens, there is a source of endogeneity that affects both processes. In general, the endogeneity of a single covariate in one process may bias the coefficient estimates of all covariates in that equation.

CHAPTER 5 DATA AND ANALYTICAL STRATEGY

5.1 Data

The analysis was carried out on retrospective data stemming from the Household Multipurpose Survey "Family and Social Subjects" (FSS). This survey was conducted by the Italian National Statistical Office (ISTAT), within the framework of a series of (seven) multipurpose surveys focused on various aspects of individual and family life. The FFS survey has been carried out approximately every five years: the first edition took place in 1998, then in 2003 and finally in 2009. We used data stemming from the last survey, carried out in November 2009 on a sample of about 24,000 households, corresponding to approximately 50,000 individuals of all ages, with an overall response rate above 80%.

The information collected and the longitudinal perspective of this survey made it an ideal source for the study of marital and non-marital unions and dissolutions, as well as fertility careers of both genders: it included detailed information on men's and women's partnership and childbearing histories recorded on a monthly basis, reporting cohabitations, premarital cohabitations and marriages, as well as biological children. Some information about adopted, foster, and stepchildren was also present.

The sample used for this analysis consisted of 7,959 men and 9,327 women aged 16-60, who had entered at least one of the following unions: direct marriage (6,592 males and 7,926 females); marriage preceded by cohabitation (941 for men and 1,012 for women); cohabitation (1,151 for men and 995 for women). The number of union dissolutions[2] was: 697 for men's direct marriages and 911 for those of women (10.6% and 11.5% of total direct marriages, respectively); 122 for male marriages preceded by cohabitation and 131 for female ones (13.0% and 12.9% of marriages with subsequent cohabitation); 558 for men's cohabitations and 320 for those of women (48.5% and 32.2% of cohabitations, respectively).

85.9% of women had at least one child, whereas the percentage was slightly lower among men (83.1%). Looking at the number of children according to the type of union, direct marriages were the most prone to fertility, because 86.1% of women ever (directly) married, and 85.0% of men, had children. For cohabiting partners the condition was reversed, because cohabitations with children were rarer than those without them: only 31.1% of cohabitations

[2] For cohabitations, the information about the type of dissolution – through the death of one of the two partners, or the separation – lacked and was imputed (see Appendix A1 for details).

lived by women and 22.6% of those lived by men had children. Finally, indirect marriages were – as it happens frequently - in an intermediate position, given that the couples with children were 72.3% for women and 71.5% for men in the sample (even if their resemblance to direct marriage was more evident).

The youngest birth cohorts, that of 1993, was selected on the basis of theoretical and practical reasons, because several interesting variables to be used in the analyses were collected only for people aged 16 and older (e.g. cohabitation history, job history, parents' education and so forth). The oldest age considered in the analysis was 60 (birth cohort of 1948), whose conjugal life started in the mid sixties/early seventies. Through this analytical choice, the first decade of cohorts belonging to our sample may be seen as representatives of the Italian "old-fashioned" demographic context, before that new family formation practices started to take ground in the eighties, and thus these cohorts may act as the reference point for comparisons with the younger cohorts.

5.2 Descriptive findings

In the analytical sample, three types of union were present for a maximum number of five unions experiences by an individual. However, most of the sample had experienced only direct marriage: 83.6% of women and 80.9% of men. Among those who have experienced more than a union, people who had tried a cohabitation were more prone to repeat the experience: among cohabiting partners, 10.7% of women and 14.9% of men went through more than one cohabitation, whereas after a direct marriage, a new conjugal experience was observed only among 0.8% of married women and 1.2% of married men did it twice or even three times (if they had cohabited before marriage, the percentages were very low, too – below 3.0%). A similar discrepancy by type of union emerged also when looking at second and higher order unions: the first union was a direct marriage for more than 80% of men and women within the sample, but the majority of second and higher order unions were cohabitations[3]. This prevalence of cohabitation after a first marriage might have many different drivers. It could be the effect of a cultural selection, because people who split up a union could be less tied to traditional values and thus favour more recent family formation practices. It could be influenced by the previous experience: those who experienced an unfortunate marriage may prefer cohabitations for subsequent relationships. Finally, it could

[3] The only exception was given by the fifth union for men, where it was the marriage preceded by cohabitation.

merely be an effect of time, because even in the past cohabitations were relatively frequent among higher order unions (whereas they were missing among first unions).

Table 5.1 – Number of relationships according to gender, type of union, and union order.

	Direct marriage		Marriage preceded by cohabitation		Cohabitation		Union	
Union order	Women	Men	Women	Men	Women	Men	Women	Men
1	7,862	6,514	994	917	888	971	9,327	7958
2	63	77	17	24	95	145	556	618
3	1	1	1	0	10	33	45	89
4	0	0	0	0	2	2	4	18
5	0	0	0	0	0	0	1	1
Total	**7,926**	**6,592**	**1,012**	**941**	**995**	**1,151**	**9,933**	**8,684**

Source: Own elaborations on FSS 2009 data.

Note: the union order was considered separately for each kind of union. For instance, direct marriages of first order were "first direct marriages", but the individual may have tried one or more other forms of union before that marriage. The same holds for all types of union.

Looking at the episodes of union dissolution, differences were remarkable. Only a small proportion of married partners experience the disruption of their relationship (just above 10%); the dissolution of cohabitations was more frequent: a third of cohabiting women, and nearly half of cohabiting men had gone through it. The percentage of dissolution tended to increase with union order for cohabitations and marriages preceded by cohabitations, whereas it diminished for direct marriages: again, the more traditional attitude and the stronger solidity of direct marriages emerged within the sample.

The type of union affects not only its final outcome, but also its duration. Looking at direct and indirect marriages, the mean duration was very similar, given that the first ones lasted 8.5 years on average, and the second ones 8.9 for women (8.4 and 9.0 for men, respectively). As expected, the intervals were longer for older cohorts, in line with the general tendency to anticipate marriage breakdown among the youngest cohorts (ISTAT 2015b). Interestingly, the spell for indirect marriages was longer than that for direct ones, even more taking into account the length of the premarital cohabitation. Summing up the duration of premarital cohabitation and the interval between marriage and separation, couples who first cohabited and then married lived together 11.7 years on average, both for men and for women. Instead, the mean duration at separation was much shorter for cohabitations: only 3.4 years for women and 2.8 for men. Thus, fewer cohabitations survived to dissolution, and they lasted less, compared to marriages. The differences between first and higher order unions were negligible.

Fertility was higher within direct: only about 14% did not have children, whereas more than 40% had two children (table 5.2). Indirect marriages were – as it happened frequently - in an intermediate position, given that the couples without children were approximately 28%, and that the modal condition was just one child (35.0% of indirect marriages). Finally, the great majority of cohabitations did not have children.

These differences could depend on three main reasons. One is the order of the union, because cohabitations were frequently second and higher order unions, which typically have fewer children (Kiernan 2002): in the analytical sample, approximately 98% of direct marriages were first unions, compared to only about 68% of cohabitations[4]. As expected, the higher the order, the lower the proportion of unions with children. Nevertheless, this difference was very remarkable only for direct marriages, where among second marriages only 30.2% of women and 49.4% of men had children. Instead, for cohabitations and indirect marriages the fertility discrepancy between first and second order was small, whereas third and fourth order unions had definitely lower fertility. The second possible motivation is the diffusion of new family behaviours – such as cohabitation and premarital cohabitation – especially among the younger cohorts, which were also those more involved by the fertility decline. Finally, the third reason concerns again the less traditional attitude of cohabiting partners, which could opt for a "childfree behaviour" contrary to what usually is expected of spouses.

Gender differences in the attitude towards children were slight, compared to the shift in the type of union. Nevertheless, the higher female fertility was remarkable for all kinds of unions, and worth of notice for cohabitations (68.9% of women within cohabitation did not have children, against 77.4% of men). As a synthesis, the mean number of children for direct marriages accounted for 1.7 children for women and 1.6 children per men, whereas it lowered to 1.2 in case of marriages preceded by cohabitation (for both genders). For cohabitations, the mean number of children is well below, and it barely reached 0.4 for women and 0.3 for men.

[4] This unbalanced proportion is well recognized in the general population, and depends on both a selection effect and an increasing lack of confidence towards marriage in second unions.

Table 5.2 – Number of biological children according to gender and type of union.

Number of children	Direct marriage		Marriage preceded by cohabitation		Cohabitation		Union	
	Women	Men	Women	Men	Women	Men	Women	Men
0	1098	991	280	268	686	891	2,064	2,150
1	2138	1779	354	329	220	177	2,712	2,285
2	3432	2853	298	270	73	72	3,803	3,195
3+	1258	969	80	74	16	11	1,354	1,054
Total	**7,926**	**6,592**	**1,012**	**941**	**995**	**1,151**	**9,933**	**8,684**

Source: Own elaborations on FSS 2009 data.

Next to children born within the ongoing partnership, the presence of children born in previous unions was explored too. This condition was very rare for direct marriages (4%); it increased to 11-12% for indirect marriages, and it reached its highest values for cohabitations, where it accounted for 18% of children from previous unions of the female partner, and for 21% of the male partner. In this case, too, the presence of children from previous relationships, and the formation of an enlarged family, was more frequent among less traditional unions, such as cohabitations.

Table 5.3 – Total number of relationships, percentage of disrupted unions and percentage of relationships with children from previous unions according to gender and type of union.

	Women				Men			
Union	Total	*% of disrupted unions*	*% with own children*	*% with children from previous unions*	Total	*% of disrupted unions*	*% with own children*	*% with children from previous unions*
Direct marriage	7,926	*11.5*	*86.1*	*4.1*	6,592	*10.6*	*85.0*	*4.3*
Marriage preceded by cohabitation	1,012	*12.9*	*72.3*	*11.1*	941	*13.0*	*71.5*	*12.4*
Cohabitation	995	*32.2*	*31.1*	*21.9*	1,151	*48.5*	*22.6*	*17.8*
Total	**9,933**	***13.7***	***79.2***	***6.6***	**8,684**	***15.9***	***75.2***	***6.9***

Source: Own elaborations on FSS 2009 data.

Table 5.4 – Descriptive indicators of partnership and fertility history. Men and women. Mean values, 1st quartile, median, 3rd quartile[5].

	Women				Men			
Covariates	Mean value	Q_1	Q_2	Q_3	Mean value	Q_1	Q_2	Q_3
Age at first birth	**24.8**	**21.2**	**23.9**	**28.0**	**28.2**	**24.6**	**28.0**	**30.8**
By cohort:								
1948-1958	*23.5*	*20.3*	*23.0*	*26.4*	*27.6*	*24.0*	*28.0*	*29.4*
1959-1968	*25.3*	*21.6*	*24.3*	*28.0*	*29.0*	*25.2*	*28.0*	*32.3*
1969-1978	*26.2*	*23.0*	*27.8*	*29.0*	*28.4*	*25.9*	*28.3*	*31.0*
1979-1993	*22.4*	*19.8*	*23.0*	*25.1*	*24.2*	*23.0*	*24.5*	*27.3*
Duration between union formation and first birth	**2.3**	**0.8**	**1.5**	**2.8**	**2.3**	**0.8**	**1.6**	**2.9**
By type of union:								
cohabitation	*2.4*	*0.8*	*1.5*	*3.1*	*2.3*	*0.8*	*1.5*	*2.9*
indirect marriage	*2.1*	*0.6*	*1.3*	*2.6*	*2.2*	*0.6*	*1.4*	*2.8*
direct marriage	*2.3*	*0.8*	*1.5*	*2.8*	*2.3*	*0.8*	*1.6*	*2.9*
Age at second birth	**27.2**	**23.0**	**28.0**	**29.5**	**30.6**	**28.0**	**29.4**	**35.0**
By cohort:								
1948-1958	*26.1*	*23.0*	*25.7*	*28.0*	*30.1*	*28.0*	*28.4*	*35.0*
1959-1968	*27.8*	*23.0*	*28.0*	*30.7*	*31.4*	*28.0*	*30.8*	*35.0*
1969-1978	*28.2*	*26.0*	*28.0*	*30.5*	*30.2*	*28.0*	*29.5*	*35.0*
1979-1993	*23.5*	*23.0*	*23.0*	*25.6*	*24.4*	*23.0*	*24.6*	*26.8*
Duration between union formation and second birth	**4.1**	**2.3**	**3.5**	**5.2**	**4.1**	**2.3**	**3.5**	**5.2**
By type of union:								
cohabitation	*3.0*	*1.7*	*2.5*	*3.8*	*3.1*	*1.5*	*2.5*	*3.9*
indirect marriage	*3.5*	*1.8*	*2.8*	*4.7*	*3.3*	*1.7*	*2.6*	*4.3*
direct marriage	*4.1*	*2.3*	*3.6*	*5.3*	*4.1*	*2.3*	*3.5*	*5.3*
Age at first direct marriage	**24.2**	**20.8**	**23.5**	**26.8**	**27.8**	**24.4**	**27.1**	**30.3**
By cohort:								
1948-1958	*23.2*	*20.2*	*22.3*	*25.1*	*27.1*	*23.9*	*26.1*	*29.3*
1959-1968	*24.6*	*21.0*	*23.8*	*27.3*	*28.3*	*24.8*	*27.5*	*31.1*
1969-1978	*25.6*	*22.3*	*25.3*	*28.6*	*28.4*	*25.6*	*28.4*	*31.0*

[5] The mean age at first direct marriage, and the mean age at first and second birth for the 1979-1993 cohort were very young, because the sample was uniquely composed by people who entered at least a union. As a consequence, the youngest cohort was formed by a very selected group in the sample.

1979-1993	*23.1*	*20.5*	*23.0*	*25.8*	*25.2*	*23.3*	*25.6*	*27.6*
Duration of direct marriage before separation	**8.5**	**2.3**	**6.5**	**12.7**	**8.4**	**2.2**	**6.3**	**12.8**
By cohort:								
1948-1958	*11.9*	*3.9*	*9.7*	*18.8*	*11.3*	*3.8*	*10.6*	*17.4*
1959-1968	*8.6*	*3.1*	*8.0*	*13.0*	*7.9*	*2.5*	*6.3*	*11.8*
1969-1978	*5.1*	*1.1*	*3.9*	*7.8*	*3.8*	*0.8*	*2.6*	*6.0*
1979-1993	*2.2*	*0.8*	*1.8*	*2.7*	*1.8*	*0.3*	*1.8*	*3.0*
Duration of first direct marriage before separation	**8.5**	**2.3**	**6.6**	**12.7**	**8.4**	**2.2**	**6.3**	**12.8**
By cohort:								
1948-1958	*11.9*	*4.0*	*9.7*	*18.8*	*11.4*	*3.8*	*10.7*	*17.9*
1959-1968	*8.6*	*3.2*	*8.0*	*13.0*	*7.9*	*2.6*	*6.4*	*11.8*
1969-1978	*5.1*	*1.1*	*3.9*	*7.8*	*3.8*	*0.9*	*2.7*	*6.0*
1979-1993	*2.2*	*0.8*	*1.8*	*2.7*	*1.8*	*0.3*	*1.8*	*3.0*
Duration of indirect marriage before separation	**8.9**	**3.6**	**6.3**	**11.7**	**9.0**	**3.5**	**7.2**	**12.2**
By cohort:								
1948-1958	*13.7*	*4.8*	*13.4*	*19.9*	*12.2*	*4.8*	*11.3*	*15.8*
1959-1968	*9.0*	*4.1*	*7.2*	*11.7*	*9.0*	*5.2*	*7.7*	*12.2*
1969-1978	*6.7*	*3.6*	*5.7*	*9.0*	*4.2*	*2.3*	*3.1*	*6.8*
1979-1993	*4.5*	*3.0*	*3.9*	*5.0*	*4.6*	*1.9*	*5.0*	*7.3*
Duration of first indirect marriage before separation	**8.9**	**3.6**	**6.1**	**11.5**	**9.1**	**3.7**	**7.3**	**12.2**
By cohort:								
1948-1958	*13.5*	*4.8*	*12.4*	*19.9*	*12.4*	*4.8*	*11.0*	*17.1*
1959-1968	*9.1*	*3.2*	*7.2*	*11.8*	*9.3*	*5.7*	*9.3*	*12.2*
1969-1978	*6.7*	*3.6*	*5.7*	*9.0*	*4.2*	*2.3*	*3.1*	*6.8*
1979-1993	*4.5*	*3.0*	*3.9*	*5.0*	*4.6*	*1.9*	*5.0*	*7.3*
Duration of premarital cohabitation	**3.4**	**1.0**	**2.3**	**4.4**	**3.1**	**1.1**	**2.3**	**4.1**
Duration of premarital cohabitation for dissolved marriages	**2.8**	**0.8**	**1.9**	**3.8**	**2.7**	**1.0**	**2.7**	**3.4**
Duration of cohabitation before separation	**3.4**	**1.0**	**2.4**	**4.8**	**2.8**	**0.9**	**2.0**	**3.7**
By cohort:								
1948-1958	*5.1*	*2.3*	*3.4*	*6.0*	*3.7*	*0.9*	*2.2*	*4.5*
1959-1968	*4.3*	*1.1*	*3.0*	*5.4*	*3.0*	*0.9*	*2.0*	*4.4*
1969-1978	*3.0*	*1.0*	*2.3*	*4.5*	*2.6*	*1.0*	*2.1*	*3.4*
1979-1993	*2.0*	*0.7*	*1.2*	*2.8*	*1.9*	*0.6*	*1.2*	*2.6*
Duration of first cohabitation before separation	**3.5**	**1.0**	**2.4**	**4.9**	**2.9**	**0.9**	**2.1**	**3.8**
By cohort:								
1948-1958	*5.5*	*2.3*	*3.8*	*6.7*	*4.0*	*0.8*	*2.2*	*5.3*

1959-1968	*4.6*	*1.1*	*3.2*	*5.6*	*3.1*	*0.9*	*2.4*	*4.4*
1969-1978	*3.0*	*1.0*	*2.3*	*4.5*	*2.7*	*1.0*	*2.1*	*3.5*
1979-1993	*2.0*	*0.6*	*1.2*	*2.8*	*2.1*	*0.7*	*1.5*	*2.8*

Source: Own elaborations on FSS 2009 data.

5.3 Model specification

As previously argued, union dissolution and fertility decisions may be simultaneously influenced by some common determinants, and may also influence each other directly. To gain insight into these issues, the empirical analysis was based on simultaneous hazard modelling, separately for men and women (Lillard and Waite 1993). Each process was represented by a continuous hazard equation. More explicitly, one model represented the fertility career of the individual, and the investigated event was constituted by the child's birth. Then, union dissolution was studied through two different modelling approaches. The first one estimated the transition to the union dissolution with three separate equations, for cohabiting couples, partners who married directly, and couples who had first cohabited and then married, respectively. The second methodology considered a unique equation for the three types of union, with a covariate to distinguish between cohabitations and marriages, and another to control for the marriages that had been preceded by cohabitation.

The aim was to assess the link between union dissolution and childbearing with great flexibility. The first approach, with three different equations, allows for the impact of children on union dissolution to differ – both in intensity and direction - depending on the type of union. The second approach, with a unique equation, leads to an assessment of the propensity to disrupt a union in the presence of children, regardless the type of union.

Each event – union dissolution or child's birth – was considered as a repeated event, so that each process accounted for multiple union spells and multiple child's birth spells. To control explicitly for their mutual effect, the outcome of childbearing history was used as an explanatory variable in the equations for union dissolution, and vice versa. Events were registered by months, while durations were translated in years (accounting for their monthly fraction) for computational reasons. Model identifications was attained through within-person replication, accounting for multiple unions and multiple child's birth for each observation. In this way, no exclusion restrictions was required for identification, and covariates might enter both equation (Lillard, Brien and Waite 1995).

Given the aim of this work, which was to clarify the association between union dissolution and fertility, in the subsequent analyses many time-varying and time-constant covariates related to childbearing were included, in accordance with the reviewed literature and the available variables in the FSS survey. Among them, the models took into account the occurrence, the number, and the timing of biological childbearing in relation to union instability through the increasing age of children. The analysis distinguished between the biological children of the current union and the biological children the subject had had previously. The children's gender was also considered

through a synthetic indicator of their sex composition: only males, only females, or both. As for indirect marriages, the birth of children during premarital cohabitation was considered. Finally, next to biological children, a time-constant covariate took into account if the subject had adopted/foster children and/or stepchildren, in order to study their effect on union disruption.

Next to the explanatory variables regarding childbearing, both models for union dissolution and fertility included several other time-varying and time-constant demographic and socio-economic covariates[6] derived from the literature (see Table 5.5 for details), with the purpose of modelling the two processes in the most comprehensive way. Both the choice of the calendar period and the cohort classes derived from the timing of the diffusion of new family formation practices in Italy: for this reason, the first category represented a landmark of the past, and it served as a term of comparison for the other classes.

The multi-process event-history analysis was conducted through separate models for men and women, in order to better grasp their possible differences.

Overall, the main interest laid in the estimates of the effect of different aspects of childbearing on union disruption risk. Parameter estimates might of course differ and be biased if the two processes were estimated separately, because fertility choices and couple's decisions clearly influenced each other. To take into account the potential influence of childbearing on union disruption, the results were presented for a series of hazard models with increasing complexity, in which a simultaneous parameter estimation substituted a separate one, and were the effect of unobserved individual characteristics was gradually introduced through a heterogeneity term. All the models were estimated via maximum likelihood, using the aML software (Lillard 1993).

[6] About the construction of the explanatory variables, see the methodological notes in the Appendix A1.

Table 5.5 – Processes and model specification

Explanatory variables	Dissolution				Fertility
	Union	Cohabitation	Direct marriage	Marriage preceded by cohabitation	
Time-varying covariates					
Duration since previous childbirth					X
0-3					
3-5					
5+					
Duration since union formation	X	X	X	X	
0-3					
3-7					
7-10					
10+					
Age					X
15-23					
23-28					
28-35					
35+					
Calendar period	X	X	X	X	
Before 1980					
1980-1989					
1990-1999					
2000-2009					
Employment (working/not working)	X	X	X	X	X
Time since i^{th} union					X
0-2					
2-4					
4+					
Children had during premarital cohabitation (yes/no)				X	
Number of years spent in premarital cohabitation (in classes)				X	
0-2					
2-4					
+4					
Time since j^{th} child's birth of the couple	X	X	X	X	
0-6					
6-10					
10+					
Type of union					X
no union					
direct marriage					
marriage preceded by cohabitation					
cohabitation					
Type of union	X				

marriage *cohabitation*					
Indicator whether marriage was preceded by cohabitation (yes/no)	X				
Union order	X	X	X	X	
Number of children had in previous unions	X	X	X	X	X
Number of children of the subject					X
Number of children of the couple	X	X	X	X	
Child sex composition *no children* *both sexes* *all females* *all males*	X	X	X	X	
Time-constant covariates					
Cohort *1948-1958* *1959-1968* *1969-1978* *1979-1993*	X	X	X	X	X
Ever had adopted/foster children and/or stepchildren (yes/no)	X	X	X	X	
Educational attainment *low* *medium* *high*	X	X	X	X	X
Parental divorce/separation (yes/no)	X	X	X	X	
Parental high education	X	X	X	X	
Macro area of residence *North* *Centre* *South*	X	X	X	X	X

Note: In the final fertility model, four covariates, which were always not significant, have been excluded. These covariates were: the indicator whether union dissolution occurred within 3 years, the union order, the parental education and the indicator if the subject had ever had adopted/foster children and/or stepchildren.

5.3.1 Four-equation specification

The first modelling approach treats each event of union separately according to the type of relationship. In this way, the multi-process event-history model was formed by four equations: one for the transition to the separation of direct marriages; one equation for the dissolution of indirect marriages; one for the transition to the separation of cohabitations; and the last equation for the transition to the j^{th} child's birth.

Analytically, the following four log-hazard equations were used to mimic the two processes under study (individual subscripts suppressed for the sake of simplicity):

(1a) $\ln h^{f}(t) = \alpha_0 + \alpha_1 Dur^{f}(t) + \alpha_2 X^{f}(t) + \alpha_3 Z^{f} + \alpha_4 Diss^{f}(t) + \alpha_5 DurUn^{f}(t) + \varepsilon^{f}$

(1b) $\ln h^{cd}(t) = \beta_0 + \beta_1 Dur^{cd}(t) + \beta_2 X^{cd}(t) + \beta_3 Z^{cd} + \beta_4 Fer^{cd}(t) + \beta_5 DurFer^{cd}(t) + \varepsilon^{ud}$

(1c) $\ln h^{md}(t) = \gamma_0 + \gamma_1 Dur^{md}(t) + \gamma_2 X^{md}(t) + \gamma_3 Z^{md} + \gamma_4 Fer^{md}(t) + \gamma_5 DurFer^{md}(t) + \varepsilon^{ud}$

(1d) $\ln h^{pd}(t) = \delta_0 + \delta_1 Dur^{pd}(t) + \delta_2 X^{pd}(t) + \delta_3 Z^{pd} + \delta_4 Fer^{pd}(t) + \delta_5 DurFer^{pd}(t) + \varepsilon^{ud}$

where, for the first equation, $h^f(t)$ was the hazard rate of experiencing a (further) birth and $Dur^f(t)$ was the time elapsed since the fifteenth birthday (for the first parity) or since previous childbirth (for the following parities) until child's birth or the time of the interview, whichever occurred first. This term captured the impact of baseline duration on the log-hazard through a piecewise linear specification: parameter estimates were thus slopes for linear splines over user-defined time periods. Then, $X^f(t)$ was the set of time-varying exogenous covariates included in the model, whose values changed only at discrete times; Z^f was the set of time-constant explanatory variables included in the model; $Diss^f(t)$ were the time-varying (endogenous) variables derived from the union dissolution models, indicating the type of union, and the union order. $DurUn^f$ was the time elapsed since union formation, and this duration, which was a continuous function of the time, was represented by a spline. Finally, ε^f was the residual heterogeneity term representing the individual-specific, time-invariant unobserved propensity to have a(nother) child.

The three remaining equations modelled the transition to union dissolution, differing for the type of union to which each equation referred: dissolution of cohabitation (*cd*), dissolution of direct marriage (*md*), and dissolution of indirect marriage (*pd*). Looking at a generic equation for dissolution (*d*), $h^d(t)$ was the hazard rate of experiencing a union disruption, and $Dur^d(t)$ was the time elapsed since union formation[7] until its disruption, the partner's death or the time of the interview, whichever occurred first, with a piecewise linear spline specification. Then, $X^d(t)$ was the set of time-varying exogenous covariates and Z^d the set of time-constant explanatory variables included in the model. $Fer^d(t)$ were the time-varying (endogenous) variables derived from the fertility model, indicating whether and how many biological children each person had within that union, the children's gender composition, and the number of children had during previous relationships. $DurFer^d$ was the duration since the jth child's birth within that union, whose values changed continuously. Finally, ε^{ud} was the residual heterogeneity term, which represented the individual-specific, time-invariant unobserved propensity to interrupt a union.

The baseline hazard rates had a piecewise linear-spline specification, i.e. a flexible representation of a continuous variable obtained by connecting a series of linear functions at specified intervals, and by allowing their slopes to vary across the intervals (Lillard 1993). In the fertility equation (eq. 1a), the time elapsed since the fifteenth birthday (for the first parity) or since previous childbirth (for the following parities) was the baseline hazard, with knots at 3, and 5 years

[7] If the union took place before 15 years old, the observation spell started at 15.

(time was measured in years in all the equations). In the other process on union disruption (eq. 1b-1d), instead, the baseline hazards were represented by the time elapsed since union formation, with knots at 3, 7, and 10 years. Then, both processes included another relevant duration: the duration since union formation for the fertility equation (the term $DurUn^f(t)$), and the duration since child's birth for the union dissolution equations (the term $DurFer^d(t)$). These durations were introduced through conditional splines: the spline switched on when the event occurred (union formation or child's birth, respectively), and was composed by some linear functions with different slopes, which changed at 2 and 4 years since union formation, or at 6 and 10 years since child's birth.

The presence of a duration term with conditional spline in the union disruption equations was crucial, because it verified whether and how the risk of union dissolution changed over time if a couple had a (or an additional) child. Then, the choice of the two knots at 6 and 10 years reflected the idea of controlling whether the risk changed with the presence of preschool children, children in school age or older children, given the previous results found in the literature (Cherlin 1977; Waite and Lillard 1991). With this specification through a conditional spline for the time since the child's birth, it was possible to control for any possible adjustment of the risk of union dissolution after childbearing, and, even more, if it changed over time.

5.3.2 Two-equation specification

The second modelling strategy considered all events of union entry and union dissolution jointly, regardless the type of relationship. The resulting simultaneous hazard model was formed by only two equations: one for the transition to the disruption of unions; and one for the transition to the jth child's birth.

Analytically, the following two log-hazard equations were used for fertility and union dissolution, respectively:

(2a) $\ln h^f(t) = \alpha_0 + \alpha_1 Dur^f(t) + \alpha_2 X^f(t) + \alpha_3 Z^f + \alpha_4 Diss^f(t) + \alpha_5 DurUn^f(t) + \varepsilon^f$

(2b) $\ln h^{ud}(t) = \beta_0 + \beta_1 Dur^{ud}(t) + \beta_2 X^{ud}(t) + \beta_3 Z^{ud} + \beta_4 Fer^{ud}(t) + \beta_5 DurFer^{ud}(t) + \varepsilon^{ud}$

Equation (2a) was the same as eq. (1a), whereas eq. (2b) modelled the transition to union dissolution. In this case, only the set of time-varying exogenous covariates differed slightly from equations (1b) to (1d), because of two extra covariates, concerning the type of union (marriage vs. cohabitation), and whether the marriage was preceded by cohabitation.

As before, the baseline hazard rates had a piecewise linear-spline specification, as well as the other duration in each equation was modelled through a conditional spline. Similarly, the knots for

the duration since union formation, and those for the duration since child's birth were the same of the four-equation specification.

5.3.3 Models of increasing complexity

In order to take into account the potential influence of childbearing on the risks of union disruption, a series of hazard models with increasing complexity were estimated; in this succession of models, a simultaneous parameter estimation substituted a separate one, as well as the effect of unobserved individual characteristics was gradually introduced.

For both modelling approaches, the residual heterogeneity terms were assumed to have the following joint bivariate Normal distribution:

$$\begin{pmatrix} \varepsilon^{f} \\ \varepsilon^{ud} \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^{2}_{\varepsilon^{f}} & \sigma_{\varepsilon^{f}\varepsilon^{ud}} \\ & \sigma^{2}_{\varepsilon^{ud}} \end{pmatrix} \right)$$

where the σ^2_{ε} terms denoted the (time-constant) variances of the individual-specific residuals, and the $\sigma_{\varepsilon\varepsilon}$ term was the (time-constant) covariance between the two residuals[8]. This last term controlled for any potential simultaneous effect of the unobserved characteristics on both processes. In the model, a negative correlation might be expected between the unobserved factors affecting fertility and those influencing union dissolution, supposing that individuals who were more likely to have children were also less likely to experience union dissolution (and vice versa).

By comparing the results obtained with increasingly complex models, the two processes were controlled for endogenous effects, influencing the relationship between fertility and union dissolution. The series of hazard models was replicated both for the four-equation specification of eq. (1), in order to control for potential selection effects of the different types of union, and for the two-equation specification of eq. (2), so as to obtain a comparable risk of union dissolution according to the three kinds of union.

The first specification of the series of hazard models was given by the single process log-hazard equations of union disruption and childbearing (without unobserved heterogeneity terms). The second one modelled the processes jointly without unobserved heterogeneity terms, with the aim of investigating whether the estimated coefficients held once the endogeneity of the two processes had been taken into account. The third series of hazard equations modelled the processes jointly, and

[8] In both cases, the individual unobserved propensity to interrupt a union was estimated through a unique term, supposing that the unobserved propensity was the same, once taken into account the type of union and the different factors that might influence the disruption of the relationship. Moreover, this choice was justified also by technical reasons: repeated events of unions were scarce in the sample (and in Italy more generally), and the estimation of an individual heterogeneity component for each type of relationship encountered many problems of under-identification, which made it impossible.

allowed for person-specific unobserved characteristics, common to both processes (childbearing and union disruption). The fourth specification of models allowed for two person-specific unobserved characteristics (one for each process), but the equations were assumed to be uncorrelated, with the aim of investigating whether the parameter estimates about the different demographic characteristics related to fertility on the risk of union dissolution persisted once the personal-unmeasured characteristics were kept under control. Finally, the fifth series of hazard models accounted for unobserved heterogeneity and correlated equations. By allowing for correlation between the two heterogeneity terms, the aim was to control for the effect of potentially common unobserved determinants of both processes (Baizan, Aassve and Billari 2003; Coppola 2004).

CHAPTER 6 RESULTS

6.1 Results from the four-equation specification model

The modelling strategy consisted of five steps, one for each specification of the series of hazards models previously outlined. Unfortunately, it was not possible to estimate all five models, because the convergence was never reached for the last model specification, which took into account both unobserved heterogeneity and the correlated equations. The other four specifications were estimated for men, whereas only the first three specifications were estimated for women (the fourth did not converge).

Table 6.2 provides the results for models of increasing complexity for the four-equation specification, concentrating on the parameter estimates regarding the effect of various aspects of childbearing on the risk of union disruption**.** The full set of parameters for each process considered is reported in the Appendix A2 (Tables A7-A10). Surprisingly, moving from the first specification of the model (Model 0), where each equation was estimated separately, to the last specification (Model 2 for women, and Model 3 for men), in which the equations were jointly estimated with one or two heterogeneity components, respectively, the significance of nearly all coefficients did not change, neither did the parameter values in any meaningful way. To sum up, once the endogeneity of the two processes (fertility and union disruption) was taken into account, the estimated coefficients held; even accounting for the personal-unmeasured characteristics, the basic relationship between fertility and union dissolution persisted.

In the estimated models, the presence of children as binding agents or destabilizing actors was investigated in various ways. Firstly, looking at women's results, the number of biological children within that union[9] had a protective impact on the risk of dissolution. Nevertheless, some differences according to the type of union emerged: while for direct marriages only two or more children significantly lowered the risk, the opposite was true for indirect marriages, where only one child was associated with a lower risk. For cohabitations, instead, the presence of any number of children had a significant binding effect, greater than it had for marriages.

As for the age of children, parameter estimates differed greatly according to the type of union. While for direct marriages preschool children had a protective effect, and seemed to give stability to

[9] The number of biological children had within that union was preferred to the birth order for explaining the effect of the presence of children on union stability, because this covariate took into account of multiple births. Moreover, the use of a categorical variable instead of a discrete one gave greater flexibility, because the effect of the presence of an additional child might not be linear, and might impact differently on the risk of union dissolution than the first child did. An equivalent model, which included this covariate with a discrete specification, gave not significant results for some types of union, thus confirming the lack of a linear effect associated with the number of children of the couple.

the relationship, decreasing the risk of dissolution compared to when they grow older, the opposite held for cohabitations. Instead, indirect marriages did not show any association between children's age and the risk of marriage disruption. Thus, for direct marriages, a plausible explanation could be that both spouses increased their commitment towards the union in this phase, when children needed more care and attention. Instead, the disruptive effect that young children had among cohabiters could be (probably) justified by a higher proportion of unplanned pregnancies, which might have posed challenges to the relationship and might have accounted, at least to some degree, for the greater likelihood of separation of these unions.

Thirdly, the children's sex composition did not seem to have an impact on the risk of union dissolution, except for indirect marriages. In this case, the presence of children of both genders lowered the risk.

About the timing for childbearing, the models directly investigated the role of pregnancies during premarital cohabitation, but no significant impact emerged.

Finally, the last aspect investigated about the role children on the (in)stability of the union concerned the presence of one or more step-, adopted or foster children. As for women, these children had a negative impact on the stability of direct marriages, but apparently no effect on the other two types of union. Instead, the presence of biological children of the woman alone had a disruptive effect on marriages (both types), whereas it had a protective one on cohabitations.

Looking at men's results, the presence of children of the couple did have a binding impact on the stability of the relationship, regardless the type of union. In particular, for all marriages, the presence of one child or two or more children were both significant, and the effect increased with the number of children. For cohabitations, instead, the presence of one child was stronger than for marriages, but having two or more children was no more significant[10]. Then, as for children's age, for direct marriages the risk of dissolution significantly decreased for children older than ten, whereas no significant effect was found at younger ages. Instead, no association emerged between the children's age and the risk of disruption of indirect marriages or cohabitations.

Children's sex composition seemed to influence only indirect marriages, given that a higher risk was associated with all male children, compared to having only female children. For cohabitations and direct marriages, no significant effect of the sex composition was detected.

Looking at the timing between childbearing, premarital cohabitation and marriage, giving birth before marriage did not show any destabilising or protective effect on the couple.

Finally, the most important differences concerning the type of union were about the presence of one or more step-, adopted or foster children. For direct marriages, both the presence of step-,

[10] To be noticed that few cohabiting partners had two or more children (only 7.2% of male cohabitations).

adopted/foster children, the presence and number of biological children of the husband alone increased the risk of dissolution. Instead, for indirect marriages, the presence of step-, adopted and foster children increased the risk of dissolution for men, while biological children of the male partner did not have any significant effect. Finally, for cohabitations the presence of children in itself, regardless of their "origin" decreased the risk of dissolution.

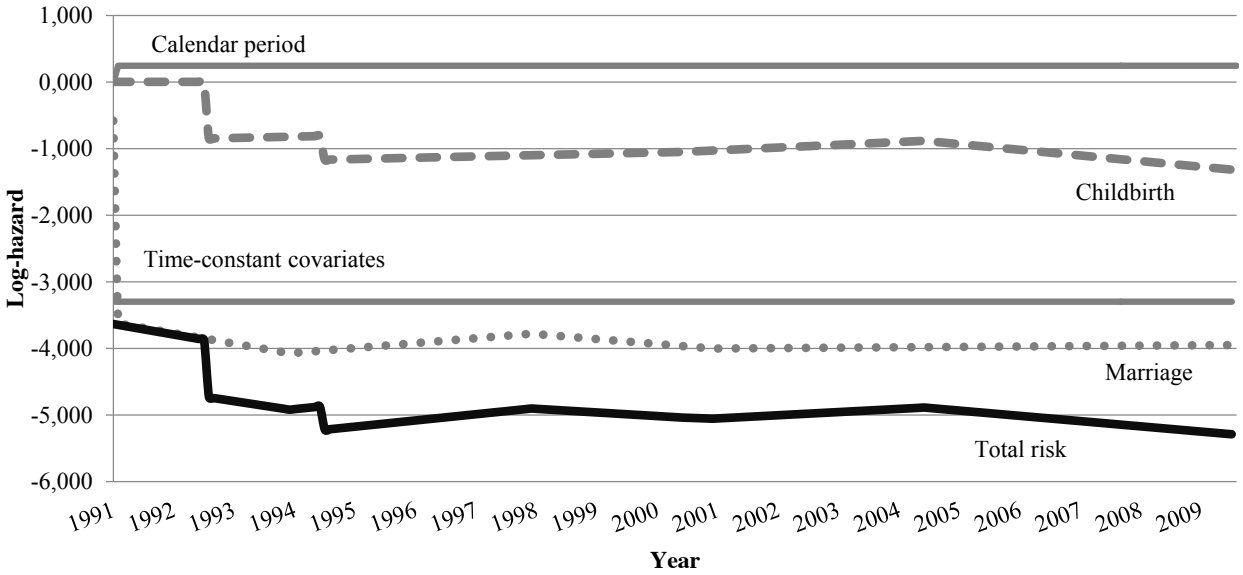
In the models, the influence of the timing in relation to the start of the union and the children's births on union disruption was investigated with a very flexible specification, because the duration since union formation and the duration since childbirth were both time-varying covariates with a piecewise linear-spline specification. Just to give an example, Graph 6.1 shows the risk of dissolution of a typical woman and a typical man in the sample. Hypothetically, they have all the mean characteristics of the sample: age at 45 for the woman and 46 for the man, medium educational level, no parental separation, no parental high education, residence in the North of Italy, no children from previous unions, "not working" woman, and working man. Both married directly: her age was 23.8 years old, his age was 27.5. Then, both had two children: the woman after 1.5 and 3.6 years since marriage, and the man after 1.6 and 3.5 years since marriage. For the two typical individuals, the model permitted to outline the risk of dissolution of their marriages from their beginning, which was September 1988 for the woman and May 1991 for the man, until the date of the interview (November 2009).

In both cases, the risk of dissolution tends to decrease in the first few years of marriage, and continues to drop after the first child's birth reaching a minimum around the second child's birth. Then, the risk of marital disruption slightly increases, as a consequence of the timing since marriage (the risk increases after three years), and it is only partially softened by the second child's birth. In the following years, the risk of dissolution vaguely fluctuates, until its long-term tendency is a monotonical, very slight decrease.

Graph 6.1 – Log-hazards from the direct marriage dissolution model of a typical woman and a typical man.

a) Typical woman

b) Typical man



The association between childbearing and union dissolution could be analysed with a gender perspective. Looking at the male and the female models, few covariates showed a different behaviour for the same type of union. Among direct marriages, the binding effect is given only by the presence of biological children of the couple, especially for men. Instead, a higher risk of disruption was found in the presence of stepchildren - of both partners -, and/or adopter or foster children. Looking at indirect marriages no effect was found for "previous" children, whereas the

binding effect of biological children of the couple was evident. Then, for cohabitations, the presence of children – any children - increased the couple stability, especially for women.

From a gender perspective, the most remarkable differences concerned the effect of children's age for direct marriages and the sex composition for indirect marriages. Preschool age children decreased the risk of dissolution for women, whereas older children had the same effect for men. On the other hand, the presence of children of both genders had a binding effect for women, whereas a disrupting effect emerged in the models for men if children were all males. These results seemed to confirm the hypothesis of the lack of a clear association between these two childbearing characteristics and union dissolution, given that the effect should have had the same direction for men and women in principle.

To sum up, the effect of childbearing on the stability of the union showed more marked differences according to the type of union than to the partner's gender. Of course, union dissolution and biological childbearing are events that involve both partners in the same way, but the same could not hold for stepchildren, which depended on previous relationships of the partner. Even more, the application of multiple union spells and multiple child's birth spells gave some interesting insights from a gender perspective. Even if the direction of the influence of childbearing covariates was the same for men and women within a kind of union, their intensity diverged: a greater propensity to disrupt the union emerged among the whole sample in favour of men, which had a higher risk of 17.6% compared to that of women[11]. Next to the male inclination towards dissolution, the higher solidity of direct marriages was clear, followed by indirect marriages, whereas cohabitations confirmed again the most unstable form of union (see Table 6.1).

Table 6.1 – Absolute annual risks of partnership dissolution according to gender and type of union[12].

	Risk of dissolution	
Type of union	Women	Men
Marriage	0.0099	0.0116
Marriage preceded by cohabitation	0.0226	0.0266
Cohabitation	0.0565	0.0665

Then, the presence of children – irrespective of their status - seemed to be a powerful agent for the stability of cohabitations, for both men and women. For all marriages and both partners, instead,

[11] The risks reported in Table 6.1 were estimated computing a joint model for both genders, where the only covariates were if the respondent was a female, and the type of union.
[12] These risks were computed through a joint model for both genders and all the types of union.

only the presence of biological children of the couple acted as binding agents for the union stability, whereas biological children of one spouse alone undermined the robustness of marriages. This apparently surprising difference presumably depended on a selection effect that derived from the union order. Higher union orders were usually more common among cohabitations than marriages; as a consequence, to have children from previous unions was more common in cohabitations, where it could be more accepted than in marriages[13]. In this sense, a "standard" family composition was normal for marriages, while more complex and "enlarged" families were more easily found (and socially accepted) among cohabiters.

The other investigated aspects – namely the children's age and the children's gender composition – did not have any generalized effect of the union solidity, as well as the timing of childbearing during premarital cohabitation or subsequent marriage did not have a significant impact on the solidity of the romantic relationship.

Two main considerations can be made at this stage. First, the importance of children of the couple as binding agents emerged clearly, regardless of the type of union and the partner's gender. Second, the analysis of the legal status of children led to an unexpected result: it impacted differently on the various types of union.

[13] In the sample, the hypothesis that children from previous unions were more common in cohabitations than in marriages was confirmed. While only 4% of direct marriages had at least one partner with previous, own children, this percentage increased to 11% for indirect marriages (for both genders), and it accounted for 18% to 21% for cohabitations (men and women, respectively).

Table 6.2 – Coefficient estimates and standard errors of childbearing covariates on union dissolution hazard models.

a) Women; Model 0-2.

	Model 0		Model 1		Model 2	
	Coeff.	Std. error	Coeff.	Std. error	Coeff.	Std. error
Dissolution of direct marriage						
Duration since childbirth						
0-6 years (slope)	-0.059 **	0.030	-0.059 *	0.030	-0.060 **	0.030
6-10 years (slope)	0.021	0.045	0.021	0.045	0.023	0.045
>10 years (slope)	-0.025	0.020	-0.025	0.020	-0.024	0.020
Ever had adopted/foster children and/or stepchildren (ref. No)						
Yes	1.453 ***	0.291	1.454 ***	0.297	1.493 ***	0.299
Number of children had in previous unions	0.388 ***	0.114	0.390 ***	0.117	0.356 ***	0.117
Number of children of the couple (ref. 0 children)						
1 child	-0.174	0.132	-0.175	0.133	-0.196	0.133
2 or more children	-0.457 ***	0.148	-0.457 ***	0.149	-0.494 ***	0.150
Child sex composition (ref. All females)						
Both sexes	-0.084	0.132	-0.084	0.133	-0.080	0.133
All males	-0.100	0.098	-0.100	0.098	-0.101	0.098
Dissolution of marriage with premarital cohabitation						
Duration since childbirth						
0-6 years (slope)	0.136	0.094	0.136	0.096	0.136	0.096
6-10 years (slope)	-0.048	0.132	-0.048	0.138	-0.049	0.137
>10 years (slope)	-0.012	0.050	-0.012	0.051	-0.013	0.051
Ever had adopted/foster children and/or stepchildren (ref. No)						
Yes	0.288	0.517	0.313	0.525	0.359	0.530
Number of children had in previous unions	0.457 **	0.180	0.455 **	0.183	0.445 **	0.189
Number of children of the couple (ref. 0 children)						
1 child	-0.785 **	0.377	-0.789 **	0.378	-0.815 **	0.379
2 or more children	-0.370	0.430	-0.372	0.435	-0.406	0.436
Children had during premarital cohabitation (ref. No)						
Yes	-0.366	0.000	-0.366	0.000	-0.366	0.000
Child sex composition (ref. All females)						
Both sexes	-1.088 **	0.429	-1.097 **	0.435	-1.091 **	0.435
All males	-0.329	0.286	-0.333	0.287	-0.341	0.289

Dissolution of cohabitation												
Duration since childbirth												
0-6 years (slope)	0.230	**	0.089	0.230	**	0.090	0.229	**	0.090			
6-10 years (slope)	-0.200		0.236	-0.196		0.237	-0.195		0.238			
>10 years (slope)	0.066		0.130	0.068		0.132	0.068		0.132			
Ever had adopted/foster children and/or stepchildren (ref. No)												
Yes	-1.175	*	0.706	-1.177	*	0.710	-1.159		0.712			
Number of children had in previous unions	-0.582	***	0.155	-0.580	***	0.159	-0.620	***	0.160			
Number of children of the couple (ref. 0 children)												
1 child	-1.306	***	0.334	-1.305	***	0.335	-1.349	***	0.336			
2 or more children	-1.714	***	0.571	-1.721	***	0.575	-1.784	***	0.578			
Child sex composition (ref. All females)												
Both sexes	0.436		0.657	0.451		0.661	0.436		0.665			
All males	0.195		0.305	0.194		0.306	0.207		0.308			

b) Men; Model 0-3.

	Model 0			Model 1			Model 2			Model 3		
	Coeff.		Std. error	Coeff.		Std. error	Coeff.		Std. error	Coeff.		Std. error
Dissolution of direct marriage												
Duration since childbirth												
0-6 years (slope)	0.020		0.037	0.020		0.037	0.018		0.037	0.020		0.037
6-10 years (slope)	0.042		0.050	0.042		0.051	0.042		0.051	0.042		0.051
>10 years (slope)	-0.085	***	0.025	-0.085	***	0.025	-0.085	***	0.025	-0.085	***	0.025
Ever had adopted/foster children and/or stepchildren (ref. No)												
Yes	2.352	***	0.237	2.362	***	0.238	2.413	***	0.255	2.362	***	0.238
Number of children had in previous unions	0.378	***	0.110	0.377	***	0.113	0.344	***	0.114	0.378	***	0.113
Number of children of the couple (ref. 0 children)												
1 child	-0.852	***	0.159	-0.852	***	0.161	-0.870	***	0.161	-0.852	***	0.161
2 or more children	-1.207	***	0.192	-1.209	***	0.196	-1.237	***	0.196	-1.208	***	0.197
Child sex composition (ref. All females)												
Both sexes	0.052		0.168	0.052		0.169	0.052		0.169	0.052		0.169
All males	0.093		0.123	0.094		0.123	0.091		0.124	0.094		0.124
Dissolution of marriage with premarital cohabitation												

Duration since childbirth												
0-6 years (slope)	-0.114		0.106	-0.114		0.106	-0.114		0.106	-0.113		0.107
6-10 years (slope)	0.133		0.144	0.134		0.145	0.134		0.145	0.133		0.146
>10 years (slope)	0.047		0.072	0.047		0.074	0.048		0.074	0.047		0.074
Ever had adopted/foster children and/or stepchildren (ref. No)												
Yes	2.755	***	0.644	2.754	***	0.651	2.769	***	0.656	2.752	***	0.652
Number of children had in previous unions	-0.631		0.498	-0.627		0.511	-0.666		0.513	-0.632		0.510
Number of children of the couple (ref. 0 children)												
1 child	-0.878	**	0.419	-0.880	**	0.424	-0.901	**	0.425	-0.883	**	0.425
2 or more children	-1.419	***	0.495	-1.420	***	0.500	-1.454	***	0.501	-1.423	***	0.501
Children had during premarital cohabitation (ref. No)												
Yes	-0.204		0.000	-0.204		0.000	-0.204		0.000	-0.204		0.000
Child sex composition (ref. All females)												
Both sexes	0.496		0.477	0.498		0.484	0.512		0.484	0.498		0.484
All males	0.742	**	0.363	0.742	**	0.366	0.738	**	0.367	0.741	**	0.367
Dissolution of cohabitation												
Duration since childbirth												
0-6 years (slope)	-0.063		0.137	-0.062		0.138	-0.065		0.138	-0.062		0.138
6-10 years (slope)	0.194		0.369	0.189		0.370	0.191		0.370	0.189		0.370
>10 years (slope)	-0.069		0.409	-0.058		0.410	-0.058		0.410	-0.058		0.410
Ever had adopted/foster children and/or stepchildren (ref. No)												
Yes	-1.011	***	0.313	-1.009	***	0.317	-1.002	***	0.324	-1.009	***	0.317
Number of children had in previous unions	-0.385	***	0.100	-0.383	***	0.103	-0.418	***	0.104	-0.382	***	0.104
Number of children of the couple (ref. 0 children)												
1 child	-1.104	***	0.337	-1.102	***	0.340	-1.150	***	0.341	-1.102	***	0.340
2 or more children	-0.727		0.584	-0.734		0.588	-0.814		0.591	-0.734		0.588
Child sex composition (ref. All females)												
Both sexes	-0.603		0.699	-0.600		0.703	-0.582		0.705	-0.600		0.702
All males	0.019		0.348	0.013		0.353	0.024		0.354	0.013		0.353

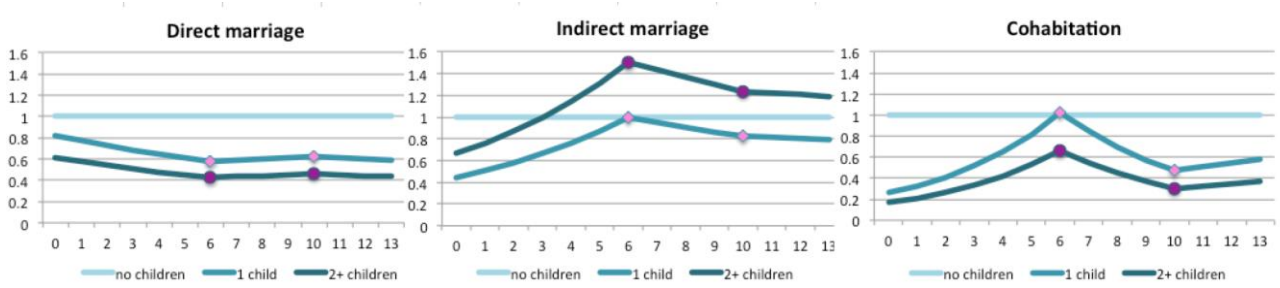
As previously stated, the effect of children's age on the stability of the relationship was assessed through a conditional spline specification of the duration since child's birth. To interpret the estimated slopes, it might be useful to represent them through a graph (see Graph 6.2 below) in which the effect of children's age was combined with the number of children.

For women, indirect marriages seemed more similar to cohabitations than to direct marriages, because both kind of partnership showed an increasing risk when children were under six years old, and a decreasing one after that age. Instead, female direct marriages had a decreasing risk immediately after child's birth. Then, direct marriages and cohabitations shared a lower risk in the presence of two or more children.

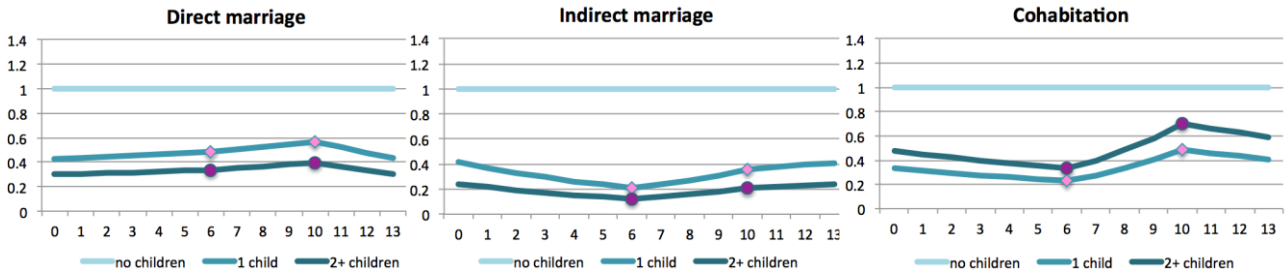
For men, the effect of the age of children the opposite was true: an increasing risk for direct marriage and a decreasing one for the other two types of union with preschool age children. In this case, both kinds of marriage shared a lower risk in the presence of two or more children, whereas it did not hold for cohabitations.

Graph 6.2 – Relative risk of union dissolution for the type of union, the number and age of children (considering all female children)[14].

a) Women.



b) Men.



[14] The interpretation of the graphs should not be made without looking at the significance of the underlying coefficients. Given that many coefficients were not significant, the graphs have a merely illustrative value.

6.2 Results from the two-equation specification model

Looking at the full model results (see Table A7-A10 in the Appendix A2), the differences between the four-equation specification and the two-equation specification could be illustrated.

With regard to the association between childbearing and union dissolution, the two-equation models had few significant coefficients, because they substantially constituted an average of the estimated parameters for the three types of union. Common to both men and women, the only two aspects that seemed relevant for the stability of the relationship, regardless of its type, were the presence of adopted/foster or stepchildren (in a disruptive sense), and the presence of biological children, whatever their number (in a protective sense). Then, the children's age, and the presence of biological children of the subject alone acted as binding agents for men, whereas having only male children had a destabilizing effect.

Through the two-equation specification, it was possible to verify whether the risk of dissolution of the different types of union, usually found in the literature, held for both genders. Direct marriages had the lowest risk of disruption, especially for men. The highest risk was associated with cohabitation, whereas indirect marriages were in an intermediate position (but the estimated coefficients were not significant). In conclusion, the results confirmed those generally found in the literature (as confirmed by the joint model in Table 6.1), but moving from the most general association, some new insights might be highlighted. For women, the presence of one child, and even more two or more children, lowered the risk of dissolution, but the effect of the type of union was stronger: the risk of disruption remained higher for cohabiting couples with two or more children than for married partners without children. Looking at men, both the type of union and the presence of children had a remarkable impact on the couple stability. The presence of children drastically reduced the risk of dissolution, and played as an important binding factor of the couple stability: for example, cohabiting partners with children had almost 80 per cent lower risk of disruption compared to those without children. Even more, while cohabiting partners with one child had a higher risk of dissolution compared to married partners without children, the opposite was true for cohabiting couple with two or more children. For both genders, the binding effect of a progeny was stronger with two or more children, but the greatest gap was observed passing from a condition of childless partners to one-child parent-partners.

Table 6.3 – Relative risk of union dissolution for the type of union and number of children.

a) Women

Relative risk of union dissolution	Cohabitation		Marriage preceded by cohabitation		Direct marriage	
	Model 0	Model 2	Model 0	Model 2	Model 0	Model 2
No children	1.000	1.000	0.746	0.748	0.459	0.460
One child	0.614	0.600	0.458	0.449	0.282	0.276
Two or more children	0.504	0.485	0.376	0.363	0.231	0.223

b) Men

Relative risk of union dissolution	Cohabitation		Marriage preceded by cohabitation		Direct marriage	
	Model 0	Model 3	Model 0	Model 3	Model 0	Model 3
No children	1.000	1.000	0.421	0.420	0.265	0.264
One child	0.324	0.324	0.136	0.136	0.086	0.086
Two or more children	0.245	0.245	0.103	0.103	0.065	0.065

Finally, several of the other covariates included in the models were associated with a higher or lower risk of union dissolution. Considering both the approaches (the two-equation model and the four-equation one), the protective factors were: living in the South of Italy, working (only for men), and belonging to the oldest cohorts. Conversely, a destabilising action on the couple relationship was given by a higher education of the subject, a parental high education, a parental separation, and working (only for women).

6.3 Comparing models of increasing complexity

The final considerations focus on the heterogeneity components and correlation coefficients. As previously stated, for the female group it was possible to estimate up to Model 2, while for men the estimation procedure was possible up to Model 3, both for the four-equation specification and for the two-equation specification. Models 2 always yielded a significant estimate of the residuals' standard deviation, indicating that there was a variability component attributable to the person-specific unmeasured characteristics in the two processes under consideration, among both men and women. Model 3 yielded a significant estimate of the unobserved heterogeneity component for fertility, whereas the estimated coefficient for union dissolution was never significant. The obtained results seemed to suggest that for men there were personal unmeasured propensity to have children,

whereas there was lack of evidence about an individual, unmeasured propensity to disrupt a union, once taken all the explanatory variables of the models had been taken into account[15].

Nevertheless, the slight change of the parameter estimates through the increasing complexity of the specified models, suggested that there were no common antecedents biasing the estimate of the impact of childbearing characteristics on the risk of union dissolution. As a consequence, the fifth modelling approach (Model 4) did not provide any further information compared to the previous specification that excluded the correlation between the two error terms (Model 3). Nevertheless, even if the residual heterogeneity terms were not correlated, a structural effect of one hazard on another introduced correlation in the processes, which justified the estimation of the two processes jointly (Model 1-3).

[15] Note, however, that this result might be influenced by the scarce number of dissolutions in the sample. The fact the Models 3 and 4 for women did not converge suggests caution in the interpretation.

CHAPTER 7 CONCLUSION AND DISCUSSION

This research project addressed the association between union dissolution and fertility, under three different research perspectives. First, it looked at three different types of union: direct marriages, indirect marriages (i.e., marriages preceded by cohabitation), and cohabitations. Secondly, it investigated several demographic features that may affect union stability and that are related to childbearing, such as the number, age, and sex of children, their legal status (biological, adopted, foster or stepchildren) and the timing of their arrival in the union. Thirdly, it considered the association between union dissolution and fertility through a gender perspective, explicitly investigating similarities and differences between men and women.

Looking at the three types of union, the presence of biological children of the couple acts as a binding agent on all types of union, for both genders. Surprisingly, the effect is stronger for men than for women[16], and for cohabitations than for marriages. Among marriages, the protective action of children is higher for indirect than for direct marriages.

Interestingly, the action of children as binding factor for keeping partners' commitment seems to be more powerful in less resilient relationships, such as cohabitations, and for males. In short, having children within the couple reduces the breakdown differences between the different kinds of union. Nevertheless, the selection effect that induces people to opt for cohabiting instead of marrying stands out more clearly, thus confirming the lower resiliency of the former kind of union consistently found in the literature, even when there are children (see e.g. Manning, Smock and Majumdar 2004; Wu and Musick 2008).

Moving from the most general association between children and union dissolution, namely the mere presence of children within a couple, and concentrating on some, more specific demographic factors related to fertility, some interesting points emerge. First, while the presence of children increases union stability, some slight differences occur in relation to the *number* of children. Indeed, these peculiarities could explain some of the inconsistencies found in the literature about the effect of higher birth orders (see e.g. Coppola and Di Cesare 2008; Lillard and Waite 1993). The greatest gap in separation risks is observed in the passage from no to one child, whereas additional children impact marginally less. In all cases, the magnitude is higher for men than for women.

Secondly, the influence of the age of children remains unclear. Compared to previous studies (e.g. Steele et al. 2005; Waite and Lillard 1991), which claim that the binding effect of children lasts only for a few years, no clear effect emerged, given the contrasting results obtained depending on the type of union and the subject's gender.

[16] The only exception is for cohabitation, where the effect is stronger for women than for men.

Thirdly, another debated hypothesis presented in the literature concerns the sex composition of children. Our results substantially confirm the lack of association between the children's gender and the stability of the couple, as stated in most other studies (see e.g. Andersson and Woldemicael 2001; Diekmann and Schmidheiny 2004)[17].

Fourthly, the timing of childbearing relative to premarital cohabitation and marriage does not appear to be significantly associated with the risk of dissolution, which is once again in line with the literature (Wu and Musick 2008).

Finally, the presence of adopted/foster or stepchildren within the couple, which is an aspect only rarely investigated in the literature, gave very similar results according to a gender perspective and the most striking difference among the various types of union. Indeed, having these children – of either partner - increases the risk of union dissolution for direct marriages, both for men and for women, while it reduces the risk of disruption of cohabitations. For indirect marriages, instead, the presence of adopted/foster children, or stepchildren seems to play a disrupting effect on the couple stability, but no common effect was found for the two genders. These interesting results are in line with what stated in the literature (e.g. White and Booth 1985), and with a cultural explanation of the phenomenon. Direct marriages, which are the most traditional form of union, are those most negatively influenced by the presence of step- or adopted/foster children. While stepchildren can constitute a source of tension and discord within a couple, adopted/foster children could reveal fecundity problems that could have created tensions and conflicts in the relationship. Indirect marriages, which can be allocated somewhere between the more traditional direct marriage and the more secularized cohabitation, have an intermediate behaviour towards stepchildren, negatively affecting the union stability particularly when they are biological children of the woman, who are the most likely to live within the same household. On cohabitations, conversely, adopted/foster or stepchildren have a protective effect, which can derive from the desire to create a new union after one of the partners, or both, had experienced previous and unsatisfying relationships, in some cases with children.

The third research perspective considers the association between union dissolution and fertility in a gendered perspective, which, as mentioned before, indicates a greater magnitude of the binding action of children for men than for women.

Given these results, the technical choice of modelling separately direct marriages, indirect marriages and cohabitations is fully justified. Even if people can enter different types of union, their expectations, desires and justifications may differ from one union to another. This is why the same

[17] Some coefficients were unexpectedly significant for marriages preceded by cohabitation, but they require some in-depth analyses for being properly explained.

person could react differently to the same (demographic) factors depending on the type of union he or she is involved in. Besides, the union order has its importance: the experiences of the previous unions drive individual reactions. Also the estimation of separate models for men and women proved warranted by the achieved outcomes.

These results agree in large part with the existing literature, and provide some new insights, especially regarding the differences between the various types of union, the gender perspective, and the presence of adopted/foster and stepchildren. Nonetheless some results, which seem in contrast with those usually found in the literature, could have a cultural and temporal explanation. The recent diffusion of other kinds of union – including cohabitations - and the increase of union dissolutions in Italy, even in presence of children, could justify the lack of a clear influence of some demographic factors, such as the children's age on the risk of union disruption. Indeed, the ethical assumption that parents' separation could negatively influence a healthy psychological growth of children if they are too young may no longer be applicable to Italy.

Moreover, a cultural and temporal explanation could even justify the lack of correlation found between the two processes under study. The chosen model specification was driven by the assumption that fertility and union dissolution are two interrelated trajectories. Then, it considered the possibility that some unobserved characteristics could simultaneously affect the decision to both have a (further) child and to interrupt a union. Unfortunately, the model did not fully support this conjecture. More precisely, the results suggest the presence of some unobserved common factors that could simultaneously affect the decision to have a further child and to interrupt a union, but they do not substantially alter the association between fertility and union dissolution. These outcomes are in contrast with what found, for instance, by Coppola and Di Cesare (2008) in terms of correlation of the personal unmeasured characteristics, because they found a negative correlation between the unobserved factors of the two processes for Italy. A supporting and mediating explanation lies in the different temporal data collection, which is 2009 for the present analysis, and was 1996 in theirs. During the last two decades, marriage dissolutions, informal unions and non-marital fertility have gained relevance in Italy, thus becoming a more widespread and broadly accepted phenomenon. As a consequence, the cultural explanation in terms of value orientation that justified the negative correlation between the two processes – people who are more likely to have a further child are also less likely to end a union – may not hold anymore. This hypothesis is supported by the lack of correlation they found for Spain, too: the Italian delay in the diffusion of the new family formation practices could have postponed of about a decade the fall of individual value orientation, which simultaneously affects fertility and union dissolution, and which the present analysis has accounted for.

The main limitation of this work is given by the assumption that the unobserved heterogeneity is time-constant, which implies that family orientation – in this case, the propensity to have children, and that to disrupt a union – is constant over time. Nevertheless, orientations towards family life may change (Aassve et al. 2002): it may be amplified, reduced or even reversed over an individual's life course to accommodate changing plans and aspirations. The assumption of time-independent unobserved heterogeneity can lead to misleading results, by failing to account for the life course dynamics of unobservable characteristics (Gottard, Mattei and Vignoli 2015).

This project does also have implications for future research, which could not be undertaken here because of the lack of information in the data. Possible extensions would need to further investigate the influence of adopted, foster children and stepchildren in terms of union stability, which has been prevalently ignored in the literature. First, it would be useful to be able to disentangle the effect of each of the three legal statuses of parental recognition towards children, so as to get more insights on the phenomenon. Secondly, the diffusion of new family formation practices and the higher risk of union dissolution are preparing the ground for a greater presence of stepchildren within romantic relationships, and of course, this issue needs to be dealt with properly in the near future. Indeed, the presence of stepchildren could influence the couple stability and may be a source of discord and tension to a great extent if they live in the same household, compared to those who live outside (this was missing information in the dataset). Finally, even the timing of adopted/foster children's arrival compared to the formation of the relationship could influence the risk of union disruption, because a more delayed arrival could promote union stability by giving the couple the time they need to develop strong interpersonal ties. Conversely, depending on how strongly the two partners want a child, a (perhaps too) long waiting time before birth could prove stressful. Unfortunately, neither desires nor waiting were had been investigated in the FSS survey.

Third Section

The birth path in Tuscany

ABSTRACT

The Tuscany region, following the WHO guidelines on the prenatal and childcare services, defined a specific procedure targeted at pregnant women, called “birth path” to take care of all clinical and non-clinical aspects of pregnancy, childbirth and postpartum.

In the literature, women’s satisfaction is specifically defined as an indicator of the quality of maternity services, which is important for several reasons, and especially because it may have positive implications on the health and well-being of the mother and the child. Still, women’s satisfaction at childbirth is comparatively under-investigated, whereas for other care services satisfaction surveys are nowadays frequent and technically refined.

This work focuses on the assessment of the satisfaction of Tuscan mothers, using “ecometrics” and multilevel models. Tuscany constitutes an excellence at the national level, both for health services and the availability of data, which, in this case, come from a specific survey on this topic, conducted in 2012-2013.

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INTRODUCTION

Italy is, and has been for several decades now, one of the countries with the lowest fertility in the world. The minimum was registered in the mid-nineties, with 1.19 children per woman. Subsequently fertility increased, but only very slightly, up to a mere 1.46 children per woman in 2010, well below replacement level, and then stalled or even declined again. Tuscany has reached even lower values, with less than one child per woman in the period 1994-1995, and only slightly more than that in the following years (ISTAT 2013; ISTAT 2014c).

Because children are rarer, they have also become more precious to their parents and to society. This has important consequences on family life, from childcare to upbringing. Parents' attitude towards the child has put more and more emphasis on safety and protection: the child has moved to the centre of the family life. This greater attention has translated, among other things, into an increased medicalization of pregnancy (ISTAT 2006; Wagner 2001). As obviation towards the medicalization of pregnancy, the World Health Organization defined a model of prenatal care, with a set of guidelines and recommendations for decision-makers and health-care providers, taking into account several aspects (Banta 2003).

The Tuscany region, following the WHO guidelines on the prenatal and childcare services, defined a specific procedure targeted at pregnant women, called "birth path" to take care of all clinical and non-clinical aspects of pregnancy, childbirth and postpartum.

In the literature, women's satisfaction is specifically defined as an indicator of the quality of maternity services, which is important for several reasons, and especially because it may have positive implications on the health and well-being of the mother and the child (Hodnett 2002; Laurence 1997; Simkin 1991; Slade et al. 1993). Still, women's satisfaction at childbirth is comparatively under-investigated, whereas for other care services satisfaction surveys are nowadays frequent and technically refined (Hundley et al. 2000; Wardle 1994). Several factors influence the woman's satisfaction with respect to the assistance received, but there is no agreement about the positive or negative effect they have (e.g., Dannenbring, Stevens and House 1997; Waldenstrom 1999).

This work focused on the assessment of the satisfaction of Tuscan mothers, through their experience during pregnancy, at childbirth and in the early postnatal period. The purpose of the study was to clarify what socio-demographic factors (if any) were associated with satisfaction during pregnancy, childbirth, and post-partum.

We took into account the multidimensionality of a concept as satisfaction using a recent application of multilevel models, known as the *ecometric* approach. Then, we examined the

hierarchical structure of the data – namely, the hospital in which the delivery took place, or the Local Health Authority in which a woman lived - through multilevel analysis.

Tuscany constitutes an excellence at the national level, both for health services and the availability of data, which, in this case, come from a specific survey on this topic, conducted in 2012-2013.

CHAPTER 8 THE PRENATAL CARE MODEL: PRACTICE AND ASSESSMENT

8.1 The prenatal care model: assessment and practice

In recent years, there has been a growing interest in the use of indicators of service quality, with the purpose of "measuring" some aspects of care services, clinical outcomes, and the incidence of certain diseases or the occurrence of some complications. These indicators allow the organizers of a specific service and policy makers to assess the performance of the involved structures, and therefore to plan actions aimed at improving the care service (Regione Toscana 2014; Valentine et al. 2003).

Focusing on a continuous improvement of health services, the users' feedback provides useful information to identify possible weaknesses in the delivery process (Elliott et al. 2010; Groene, Skau and Frolich 2008). The patient's opinion in the assessment of a health service has become increasingly important in recent decades, and is now considered an integral part of the monitoring process for improving the quality of services (Health 1991; Williams 1994). The measurement of the patient's satisfaction fulfils several functions, which can be classified into three categories: healthcare experience from the patient's point of view; "measure" and identification of critical elements of the care process; evaluation of health care (Sitzia and Wood 1997).

For the evaluation of the satisfaction of a health service, a key point is how to measure this opinion. Satisfaction is a subjective attitude and it cannot be measured directly: a scaling procedure must be devised. A widely used scaling procedure is the Likert-type scale, based on a set of statements, typically, with five response categories for each item: e.g. "strongly agree, agree, undecided, disagree, or strongly disagree" with a given assessment (Likert 1932). Some authors claim that seven response alternatives would be better (Morrison 1972; Peter 1979; Ramsay 1973; Symonds 1924). However, others (Jacoby and Michael 1971; Peabody 1962) suggest that as few as three alternatives may be appropriate in some cases. In any case, Likert scales typically have an odd number of categories, and answers tend to be normally distributed. A multi-item strategy to the evaluation of quality and satisfaction is more effective than a single-item one, for two main reasons. First, because of measurement errors: these affect individual answers randomly, and average out when several scores are added to obtain a total score (Nunnally and Bernstein 1994). Secondly, because a unique item can at best represent only a limited part of a complex theoretical concept, which a multi-item approach can reveal more effectively (McIver and Carmines 1981).

Not many national or international sample surveys aim to detect the experience of pregnant women, contrary to what happens for other care services (cf. e.g.Dowswell et al. 2001; Hundley et al. 2000; Wardle 1994). In all cases, most of these surveys try to investigate the satisfaction during delivery (cf. e.g. Shields et al. 1998), but only a few cover other aspects of pregnancy, childbirth and postpartum. Nevertheless, all these surveys show the importance of women's satisfaction as an indicator of the quality of maternity service, with practical implications both for service providers and for decision makers (Hodnett 2002).

The patient's satisfaction has positive implications for the health and well-being of the mother and the child (Laurence 1997; Mackey 1995; Simkin 1991; Simkin 1992; Slade et al. 1993; Waldenstrom et al. 1996). Women's satisfaction is usually conceptualized as a global assessment of childbirth, although this concept is clearly complex and multidimensional (Goodman, Mackey and Tavakoli 2004). Several factors influence the woman's satisfaction with respect to the assistance received, but there is ample disagreement on their role. For instance, focusing on the relationship between women's satisfaction and some socio-demographic variables, some researchers have identified a negative correlation between the level of education and the satisfaction of childbirth (women with low levels of education tend to be more satisfied; Dannenbring et al. 1997; Waldenstrom 1999); while others have found no relationship (Mackey 1995). Furthermore, greater satisfaction was sometimes found at older ages (Waldenstrom 1999), but not always (Mackey 1995; Ranta et al. 1995). Finally, in Waldenstrom (1999), but not in other studies (Ranta et al. 1995; Waldenstrom et al. 1996), greater satisfaction characterized higher birth orders.

8.2 The WHO model of prenatal care and the "Path to Safe Birth" of Tuscany

Before the twenty-first century, the prenatal care towards the woman and the unborn child that was generally practiced in the most developed countries was not subject to rigorous scientific evaluation, and its clinical validity remained dubious. In this context, the demand for improved maternal and perinatal care services led to the adoption of sometimes useless, ineffective or even harmful interventions, with a considerable waste of resources: the excessive recourse to Caesarean sections is an example. The need to define standards for the care of both the woman and the baby arose. This led, among other things, to predetermine the number of visits, tests, clinical procedures and follow-up actions necessary to a successful outcome of the pregnancy, according to sound scientific evidence (Villar and Bergsjø 2002).

The trend towards the medicalization of pregnancy, which spread in all Western countries, started to be questioned in the nineties, with the definition and introduction of standards of prenatal

care. A few years later, the Millennium Development Goals (MDGs) included an improvement in the quality of life of both mother and child among the health priorities worldwide. But, in fact, the theme had already been mentioned several years earlier, in 1948, when the WHO (World Health Organization) and the United Nations stressed the importance of maternal and child care, as recognized by the Universal Declaration of Human Rights (UN 1948; WHO 1948; UN 2004).

Thus, the World Health Organization defined a model of prenatal care, with a set of guidelines and recommendations for decision-makers and health-care providers, taking into account several aspects. According to the WHO, primary health services should encourage the awareness and capacity for self-determination of women (empowerment), and be characterized by a social model of health, including an integrated and effective communication between the parties involved (Banta 2003).

In such a rethinking of the approach to maternal and child care, the 1998-2000 National Italian Health Plan developed the Project Mother and Child (POMI DM 04/24/2000), which put a new emphasis on women's health and adopted the recommendations on the World Health Organization. These major changes in the guidelines of the National Health System prompted the Tuscany region to take extra measures, with the aim of standardizing pregnancy and childbirth practice and defining a minimum standard of checks and controls at the regional level, which became known as “Path to Safe Birth” (*percorso nascita*). The idea was to accompany women’s pregnancies through all their stages (antenatal, childbirth and postpartum), both from the clinical and psychological point of view. Counselling became widespread and, at the time of delivery, women could choose between 25 birth centres located throughout the region, in selected hospitals where childbirth was safe (Piano Sanitario Regionale 2008-2010).

CHAPTER 9 RESEARCH HYPOTHESES AND METHODS

9.1 Objectives of research

In this context, the aim of this work was the evaluation of the satisfaction of users of the Tuscan "birth path", through their experience during pregnancy, at childbirth and in the early postnatal period in the relationship with the "Path to Safe Birth" of the Tuscany region. To do this, the hospital in which the delivery took place and the Local Health Authority (i.e. the area of residence of the woman) were taken into account.

Given the reviewed literature, the purpose of the study was to clarify what socio-demographic factors (if any) - such as the educational attainment of the woman, her age, her citizenship, and the number of her previous pregnancies - were associated with satisfaction during pregnancy, childbirth, and post-partum. In doing so, the aim was to take into account the multidimensionality of the concept (women's satisfaction), and to analyse the association during the period of gestation, at the delivery, and in the postpartum phase, separately. The attention was also drawn to the context in which the woman lived or the hospital in which she gave birth, in order to disentangle the possible association existing between peculiar characteristics of the context/hospital and the woman's satisfaction. The context or the hospital were defined through some indicators of maternal service quality drawn from the Performance Evaluation System of Health Care, developed by the *Laboratorio Management e Sanità* (*MeS Lab*) of the *Scuola Superiore Sant'Anna* of Pisa (Nuti 2008).

The association of socio-demographic factors in the different phases of the process could be partly disentangled by constructing separate models. Some covariates, such as the educational attainment or the age of the woman giving birth, happened to be associated differently in the various stages, for instance during pregnancy and at the delivery. Another aim of the study was to shed light on some of the inconsistent results found in the literature.

The analyses took into account the hierarchical structure of the data through the use of multilevel models. Indeed, models that assume that the variables are all at the same level do not fit reality well enough. Models work better when the hierarchical structure of the data, which is known *a priori*, is explicitly taken into account.

Finally, instead of systematically using a single-item or a multi-item approach, the two methods were combined, in such a way as to aggregate some intermediate items and use a unique item to represent the underlying latent trait. Specifically, items that aimed at evaluating the satisfaction towards specific aspect of the services and that influence the overall satisfaction – which could be defined as intermediate items – were aggregated with a recent and promising application of

multilevel models, namely the *ecometric* approach (Raudenbush and Sampson 1999). Instead, items that aimed to assess the overall satisfaction were treated separately, as response variables of the multilevel models, where the dependence of these on the aggregated measures of intermediate items was obviously taken into account.

9.2 Ecometrics

The ecometric approach, or latent variable analysis in multilevel analysis, is a multilevel method, which aims to combine multiple items into one scale and to analyse the validity and reliability of the scale. The term 'ecometrics' has been coined as an analogy to psychometrics, where the difference is that it does not aim to measure latent psychological characteristics of individuals, but latent characteristics of ecological units (Raudenbush and Sampson 1999).

It measures characteristics of ecological units on the basis of multiple observations or responses, and uses multilevel analysis to estimate the higher-level effect – e.g. a neighbourhood effect or a hospital effect – net of the individual variation at other levels (Groenewegen 2015). This technique accounts for differences in the number of respondents on which the estimation is based, for individual differences in response to certain items, and for the dependency between the items that measure the latent variable (Raudenbush and Sampson 1999). The interest lies in the common component in all responses about the same unit, net of the individual component. When the responses at the individual level form a scale where several questions together are supposed to measure a characteristic of the higher-level unit, the items are not only nested in the individuals that fill in the questionnaire but also in the higher level units (i.e. the neighbourhood or the hospital) that the researcher wants to characterize. The solution is to analyse the data in a multiple response model with items at the lowest level, nested in individuals and higher-level units (Groenewegen 2015). In sum, the ecometric approach constructs a contextual variable, which reveals something about higher-level units, based on individual level observations.

The ecometric technique is usually formed by two stages. In the first step, a multilevel linear model is constructed, where the lowest level is at the item level, and the response variables are the items that need to be combined into a higher-level unit characteristic. The items that are included in the model are those measuring the latent variable. Then, the contextual residuals – namely, the residuals of the model at the highest level - constitute the scale measurement of the latent variable. Indeed, the residuals are a measure of the variability that the model cannot explain: in the ecometric model, this information refers to the latent variable at the contextual level. A reliability score, which is equivalent to Cronbach's alpha in psychometric scale analysis, is computed in order to evaluate how well the individual items of a scale measure the underlying concept of the same scale. This

score varies between 0 and 1 and values above 0.6 are considered to be adequate (Moss et al. 1998). In the second stage, the higher-level residuals – namely, the scale measurements of the latent variable - are treated as covariate at the contextual level in the subsequent multilevel analysis.

Concentrating on the first step of the analysis, in which a scale measurement at the highest level is evaluated, the data structure is usually as follows: the items are the lowest level, nested within individuals, who in turn are nested within the context (e.g. the neighbourhood or the hospital), which is the highest level (e.g. Mohnen et al. 2015; Raudenbush and Sampson 1999; Waverijn et al. 2014). Individual information, such as socio-demographic characteristics, may be added in order to explain the item variability, which can be attributed to individuals. This is an advantage of ecometrics above the traditional approach of simply aggregating the individual scale values, because it allows adjusting for composition effects by including individual explanatory variables.

Even if items are usually constructed on a Likert-type scale, the most employed multilevel model is the model for continuous response variable, because it is easier to handle and gives satisfying results, if the number of categories is sufficiently high and the underlying distribution is not excessively skewed (Grilli and Rampichini 2011).

The resulting model is a three-level linear model of the following form:

(1) $y_{ijk} = \beta_0 + \sum_{m=1}^{q-1} \beta_m D_{mjk} + \sum_{p=1}^{r} \beta_m X_{mjk} + v_k + u_{jk} + e_{1jk} + .. + e_{qjk}$

where y_{ijk} is the response to item *i* of respondent *j* in the context *k*, β_0 is the intercept, *q* is the number of items (one of which used as reference), D are the *q-1* item dummies, and *r* is the number of first-level and second-level covariates optionally included in the model. The remaining terms represent the error level structure (the random effect of the model), which are:

(2a) Contextual level: $v_k \sim N(0, \Omega_v)$, $\Omega_v = [\sigma_{v0}^2]$

(2b) Individual level: $u_{jk} \sim N(0, \Omega_u)$, $\Omega_u = [\sigma_{u0}^2]$

(2c) Item level: $\begin{bmatrix} e_{1jk} \\ \cdot \\ e_{qjk} \end{bmatrix} \sim N(0, \Omega_e)$, $\Omega_e = \begin{bmatrix} \sigma_{e1}^2 & & \\ . & . & \\ 0 & . & \sigma_{eq}^2 \end{bmatrix}$

The error terms are assumed to be normally distributed and independent of the other error terms. At the first level, each item has its own error term, and they are independent of each other: therefore, the unexplained variability attributed to each item can vary. Errors are implicitly assumed

to be heteroschedastic, because the variance depends on the observations. Moreover, the covariance for two observations within the same clusters is non-homogeneous, because it depends on the covariate values. Then, the two random effects are uncorrelated for units belonging to different groups.

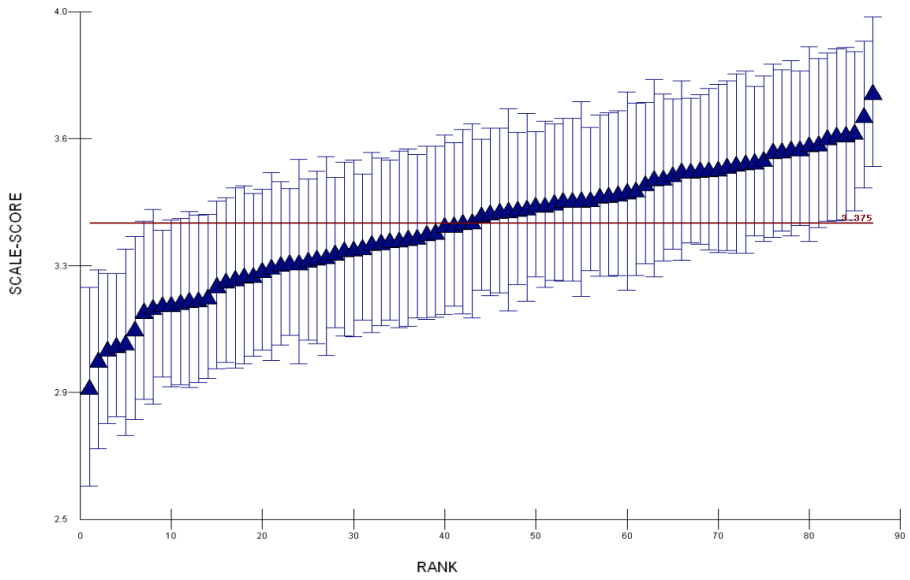
The reliability score is computed in order to evaluate how well the individual items of a scale measure the underlying concept of the scale. This coefficient takes into account the variance at the three levels, i.e. the contextual-level variance, the individual variance and the item variance (Raudenbush and Sampson 1999), and is estimated by:

$$(3) \quad \lambda = \frac{\sigma_{v0}^2}{\sigma_{v0}^2 + \frac{\sigma_{u0}^2}{\widehat{n_j}} + \frac{\sigma_{e1}^2 + .. + \sigma_{eq}^2}{\widehat{n_j}\widehat{n_l}}}$$

where $\widehat{n_j}$ is the average number of individuals per context, and $\widehat{n_l}$ is the average number of items per person.

Finally, the contextual residuals may be combined with the mean scale value to rank the context according to the measured latent variables (see Figure 9.1 for an illustrative example).

Figure 9.1 – Example of ranking of hospital wards through the use of the ward residuals and the mean scale value.



Source: Groenewegen (2015).

9.3 Multilevel proportional odds model

Multilevel analysis was developed in the social sciences from two distinct research strands: the contextual analysis on the one hand, from which it derives its attention to the hierarchical structure of the data; and mixed effects models on the other hand, developed as part of the analysis of variance and regression models. Subsequently, multilevel analysis has also been applied in other research settings; it is, in fact, applicable to any type of study in which there is a hierarchical data structure, divided into two or more levels. Finally, among various topics, since the 1990s multilevel models have acquired relevance in the evaluation of care services, clinical outcomes, or the incidence of certain diseases (Duncan and Gibson-Davis 2006).

The "level" is the key concept of multilevel analysis, because it takes into account the hierarchical structure of the data. Multilevel analysis was developed because traditional models, assuming that variables are all located at the same level, did not fit reality well enough. In multilevel analysis, instead, the hierarchical structure of the data is known *a priori* and is one of the milestones for the model construction.

The hierarchical structure of the data may be of two types: individuals (lower level) who belong to different settings (the environment, at a higher level), or, in the case of longitudinal data, individual measurements (lower level) that are repeated for each person (higher level) (Leyland and Goldstein 2001). Multilevel analysis assumes that the units that belong to the same group at the second and higher level have a certain degree of similarity, i.e. are not independent each other. The main characteristic of multilevel models concerns the fact that the variability of the dependent variable is attributed both to the variability within the groups (i.e. between the units of the first level), and between the groups (between the units of the second level). Such sources of variability must be modelled appropriately, so that each level has one or more error terms. In a multilevel model the response variable must be, therefore, at the lowest level, since it depends on all levels. The data structure, finally, is hierarchical: the units at the lower level are nested in a higher one (Snijders and Bosker 1999).

In the case of ordinal dependent variables, ad hoc multilevel models have been developed, which are the multilevel extension of the generalized linear models with an ordinal response variable (Agresti 2010). When the response variable is ordinal, the model must take advantage of the information on ordering between categories, avoiding the arbitrariness of scoring systems. Such a variable with C categories has a multinomial distribution, $\Pr(Y = y_c) = \pi_c$, of C-1 dimension, because there is one redundant probability ($\pi_1 + \pi_2 + .. + \pi_C = 1$). For ordinal variables representing satisfaction, attitudes, opinions, etc., it is usually common to assume that an ordinal

variable Y with C categories is generated by a latent continuous variable Y*, with a set of thresholds α_c^* such that if $Y = y_c$, then $\alpha_{c-1}^* < Y^* < \alpha_c^*$ (Grilli et Rampichini 2011).

The multilevel proportional odds model is the multilevel extension of the cumulative model, where the link function is a logistic function, and the response variable is Y with C ordered categories. In this case, the model is formed by C-1 equations of the following form:

(4) $g(\gamma_{cij}) = \alpha_c - (X'_{ij}\beta + u_j), \quad c = 1, 2, \dots, C-1$

where:

- g is the link function (i.e. the logistic function);
- γ_{cij} is the cumulative probability up to the c[th] category for unit *i* in cluster *j*, $\gamma_{cij} = \Pr(Y_{ij} \leq y_c)$;
- α_c is the specific threshold for the c[th] cumulative probability;
- X_{ij} is a vector of first- and second- level covariates, including the intercept;
- β is a vector of regression coefficients, including the intercept coefficient β_0, that are constant for all C-1 categories (namely, equations);
- u_j is the random effect for cluster *j*, and it is usually assumed independent from random effects of other clusters, and identically distributed, $u_j \sim N(0, \sigma_u^2), \forall i = 1, 2, .., C-1$.

The last category is obviously omitted, because $\gamma_{Cij} = \Pr(Y_{ij} \leq y_C) = 1$, and β_0 or α_0 is forced to zero because of multicollinearity. The random effect, u_j, represents the unobserved variability at the cluster level, and it gives the random shift of cluster *j* from the mean effect given by the intercept β_0. The threshold α_c can be interpreted as the mean of the c[th] cumulative probability among all clusters.

In the multilevel proportional odds model, the linear predictor becomes:

(5) $\eta = logit\,(\gamma_{cij}) = \log\frac{\gamma_{cij}}{1-\gamma_{cij}} = \log\frac{\Pr(Y_{ij} \leq y_C)}{\Pr(Y_{ij} > y_C)} = \exp\left(\alpha_c - (X'_{ij}\beta + u_j)\right)$;

therefore, the odds ratio for any two units is always the same for all C-1 categories, but it takes into account whether the two individuals belong in the same cluster or not[18].

The estimated slopes of the model represent conditional or cluster-specific effects, because they summarize the relationship between covariates and the cumulative probabilities after that random effects have explained a portion of this relationship, which is different for each cluster. Conditional slopes are population parameters, because they are constant all over the clusters and the categories.

[18] The odds ratio depends only on regression coefficients β if the two units belong to the same cluster; it depends also on the two random coefficients u_j and u_k if they belong to different clusters *j* and *k*.

The sample size required for fitting a multilevel model for ordinal data depends on several factors: the complexity of the model, the value of the cluster variance, the estimation method, and so on. In the random intercept case, estimates are reasonably good already with 10-15 clusters (Austin 2010), whereas the requirement for the random slope model is higher: 30 clusters or more (Moineddin, Matheson and Glazier 2007).

CHAPTER 10 DATA

10.1 The survey

Given the clinical and practical importance of the evaluation of health care performances, since 2004 the Tuscany Region has adopted the Performance Evaluation System of Health Care of the *Laboratorio Management e Sanità* of the *Scuola Superiore Sant'Anna* of Pise (Nuti 2008). The Performance Evaluation System aims to provide a summary of the operating performances in the Tuscan local health authorities and hospitals according to a multi-dimensional approach, which is also a pillar of the management of the regional health system (Regione Toscana – Lab Mes 2014). The final product of the evaluation system is a yearly report with a detailed series of indicators on the multidimensional service quality of local health authorities and other territorial levels. The dimensions subject to assessment are: the ability to pursue regional strategies; the population's health status; the clinical evaluation; the patients' satisfaction; the working climate; the operating efficiency and the financial performance. In addition to administrative data from health authorities and other entities and structures, the *Laboratorio Management e Sanità* relies on sample surveys on different actors (users, staff, etc.) involved in the supply or fruition of the Regional Health Service.

The present study is based on one of these surveys, focused on the satisfaction and experience of the users of the "Path to Safe Birth" in Tuscany. As of now, there have been four such surveys (2004-2005, 2007, 2010, 2012-2013) (Nuti and Murante 2014), which are characterized by:

1) The wealth of information collected in the questionnaires, about the antenatal, childbirth and post-delivery experience of women, and assessment of the birth path according to:

- the global procedure;
- the coordination between structures;
- the quality of available health services during pregnancy;
- the accessibility to services;
- the assistance received by women during the hospitalization in which the delivery took place;
- the teamwork of hospital staff;
- the hospital in which the delivery took place;
- the counselling, the structure or the practitioner who followed her in the post-partum period, and

2) The large sample size: women interviewed in each survey represented all the hospitals where childbirth took place in the region.

In this work, individual data were those collected from the most recent edition of that survey, between October 2012 and March 2013. Women were contacted through the dispatch of the questionnaire in six languages to their home; then, they could complete the interview through postal questionnaires, CAWI or CATI methods.

A random sample of women was drawn from the sample frame, i.e. from the lists of women who had given birth in one of the 25 Tuscan hospitals during the preceding six months. This sample was representative of the population of women who delivered in each hospital (target population); the amount of this population was identified by the number of births recorded through the Certificate of Assistance at Birth, filled by the medical staff during pregnancy and hospitalization for delivery, for the year 2011.

The sample size for each hospital was determined in such a way as to be significant at 5%, and was then inflated considering an expected response rate of 25%, as registered in the latest two editions of the survey. Of the 12,355 women invited to participate, 4,598 responded to the questionnaire (37,23%); they exceeded the expectations, and represented all the hospitals where childbirth took place in the region and all the Local Health Authorities in which the region is divided. In the model for delivery, we considered all 4,598 women who gave birth in the Tuscany region and participated in the survey; instead, models for prenatal and postnatal periods excluded the 131 women who did not live in Tuscany (2.85% of the respondents).

Information collected in the questionnaire covered the antenatal, childbirth and post-delivery experience of women in terms of clinical data, personal experience and socio-demographic characteristics. Questions collected for assessing women's satisfaction used a Likert-type scaling procedure, with three or five response categories.

10.2 Measurements

10.2.1 Measurements at individual level

In case of perceptions and evaluations, multiple questions are often preferred over a unique, overall satisfaction indicator. In the following analyses about pregnancy and delivery, there were two types of items about satisfaction, which were treated differently. Those on the "overall" satisfaction towards the services and the assistance received were used as response variables in the multilevel analysis. These items used a Likert-type scaling procedure, with five response categories

and the following modes: excellent, good, fair, poor, and very poor, which were translated into five ordered categories ranging from 1 (very poor) to 5 (excellent).

Conversely, those on women's satisfaction and opinion about specific services of each phase (pregnancy and delivery) were treated with ecometrics. Indeed, these items expressed only a partial view of the latent variable, and could therefore be thought to qualify "intermediate" satisfaction. Two questions were asked:

a) When you received the health book with the prescribed examinations, did the staff present the birth path and the services offered by your Local Health Authority?

Not at all; Little; Sufficiently; Much; Totally.

b) How do you rate overall the course preparing for birth?

Very poor; Poor; Fair; Good; Excellent.

As for delivery, the three items of intermediate satisfaction measured the confidence that women had in doctors, nurses and midwives, with the following questions and answers:

During the recovery, did you trust the staff who assisted you?

a) Doctors *Very much, Much, Quite, Not much, Not at all*

b) Nurses *Very much, Much, Quite, Not much, Not at all*

c) Midwives *Very much, Much, Quite, Not much, Not at all*

In the postnatal period, the satisfaction towards the services and the assistance received – namely the overall satisfaction - was measured through another kind of item, which aimed at evaluating the willingness to recommend the services. In this case, three response categories were used: *definitely no, maybe, definitely yes*.

In the multilevel analyses, some socio-demographic covariates were employed in order to clarify the association of age, education, citizenship and previous pregnancies with women's satisfaction. Moreover, the typology of survey response – through postal questionnaire, CAWI or CATI method - was taken into account. In addition, each model comprised other covariates specifically related to women's clinical conditions and use of services of that phase. In the model about pregnancy, the included explanatory variables were:

- if the woman had visited the hospital before delivery,
- the physiological or pathological progress of pregnancy,
- if the number of echographies was lower than recommended[19]

In the model for childbirth, the individual level covariates were:

- whether the woman had had a preterm delivery,
- the type of delivery,

[19] The Tuscan recommended procedure prescribes three echographies during pregnancy.

- whether she had delivered in a hospital out of her Local-Health Authority,
- whether she had had information about breastfeeding and whether this information was provided consistently by all the staff,
- the evaluation of pain control,
- whether the woman had felt alone during labour or delivery,
- whether there had been skin-to-skin contact between with new-born after delivery,
- whether the mother and the new-born could stay together during the hospitalization period.

Finally, for the postnatal period, the covariates included were:

- whether the woman had had a preterm delivery,
- the type of delivery,
- the overall satisfaction towards prenatal services and during delivery.

10.2.2 Measurements at health district level and hospital level

The main advantage of a multilevel model instead of a fixed-effect model is that it allows researchers to include covariates at different levels. In this case, we included some second level covariates, in order to (partly) catch the variability among health districts or hospitals. These contextual variables were ad-hoc indicators derived from the Performance Evaluation System of Health Care of Tuscany.

In the model for pregnancy, we included two health district covariates[20]: the first one, the access rate to the counselling of childbearing-age women, tried to take into account the diffusion of prenatal services in the district; the second variable, the percentage of women who did prenatal screening in the district, looked at the proactivity of service providers.

In the model for childbirth, the contextual level covariate[21] was the percentage of breastfeeding within 2 hours from delivery in the hospital.

Finally, for the postnatal period, the covariates concerned the rate of access to the counselling of childbearing-age women in the district (as in the prenatal model), and the percentage of women who accessed at least one time to the counselling during post-partum in the district.

[20] Including more health-district covariates (the percentage of first-child pregnant women who attended at least three prenatal classes, and the rate of conception among girls under 18 per 1000 women aged 12-17) proved unviable: they were not significant and, on top of that, they were collinear with the others already included.

[21] In the delivery model, the inclusion of three more health-district covariates was attempted, but they were not significant and created some collinearity problems with the other second-level covariate. The three variables were: the Cesarean section rate - excluded Nulliparous Term Singleton Vertex (NTSV) births-; the percentage of women who was asked for a skin-to-skin contact between the mother and the newborn; the evaluation of ability in team-work among employees.

10.3 Descriptive findings

In the sample, the number of women in each of the thirty-four health districts ranged between 14 and 361, with an average of 131. Similarly, among the twenty-five hospitals where women gave birth in Tuscany, the number of women per hospital varied from 30 to 398, with an average of about 184.

Women were between 16 and 50 years old, with a mean age of 34 years (median=35 years). Compared to the Tuscan mean age at birth of 31.7 (ISTAT 2014c), the sample was formed by older women: only 2.9% of respondents were under 25, whereas 14.9% were 40 and over, while in Tuscany these proportions were 5.1% and 10.8% respectively (and both about 8.5% at the national level) (ISTAT 2014c). Note that age likely influences women's satisfaction and experience, for instance because in Tuscany some health services are free for pregnant women aged 35 and over.

Looking at women's citizenship, foreign women, about 10%, were underrepresented in the sample, considering that in the Tuscan population children born from both foreign parents were 19.9% in 2013. And this despite the attention specifically devoted to foreign women, with the use of questionnaires translated in several languages and the overrepresentation of foreigners in the sample list.

Most respondents were at their first pregnancy (51.37%), whereas only a few of them had had two or more previous pregnancies. In this case, differences according to citizenship were limited, with only six percentage points separating foreign women coming from non-Western countries on one side (46.3% of them were at their first pregnancy), and women coming from Western countries on the other side (52.7%).

According to the last socio-demographic covariate under analysis, the educational attainment, the modal class (46.5%) was formed by women with medium education. As expected, educational was related to citizenship: women coming from non-Western countries were markedly less educated; instead, women from Western countries were better educated, with almost 73% of them holding a university degree.

The overall satisfaction towards prenatal services and during delivery was generally high, especially for the second phase (the mean value of satisfaction was 4.02 during pregnancy, and 4.13 during delivery)[22]. Women's satisfaction towards specific services was generally lower, except the confidence towards midwives, which surpassed all others indicators. To sum up, women appreciated the good work done by the services and the personnel: the first quartile of overall satisfaction was 3 only for five health districts during prenatal phase, and for just three hospitals at

[22] Satisfaction during the first two phases was measured through indicators that varied between 1 (very low) and 5 (very high). For the postnatal period, satisfaction was measured indirectly, through the willingness to recommend the services, which varied between 1 (no) and 3 (yes).

childbirth. Even for postpartum, the overall satisfaction of women was well accounted for, with an average of 2.74 (out of 3) among all 34 health district, and a first quartile value of 2 for just seven health districts.

Table 10.1 – Descriptive statistics of individual items.

	mean	**st.dev.**	**per cent**
Number of women per health district	131.38	86.62	
Number of women per hospital	183.92	91.60	
Educational level			
Low			13.27
Medium			46.50
High			40.23
Citizenship			
Italian			90.30
Non-Western country			8.50
Western country			1.20
Age	34.35	4.91	
<25			2.90
>=40			14.90
Number of previous pregnancies	0.76	1.18	
0			51.37
1			35.23
2+			13.40
Opinion of women about the introduction of the birth path and the services	3.47	1.19	
Satisfaction towards the course preparing for birth	3.91	0.90	
Overall satisfaction towards prenatal services	4.02	0.71	
Confidence that women have towards doctors	4.05	0.93	
Confidence that women have towards nurses	3.94	0.96	
Confidence that women have towards midwives	4.23	0.92	
Overall satisfaction during delivery recovery	4.13	0.88	
Willingness to recommend postnatal services	2.74	0.55	

Source: own elaboration on survey data.

During pregnancy, the most satisfied women were the more educated: their positive evaluation (good or excellent) exceeded by ten percentage points that of the less educated. Plausibly, better-educated women were more involved in prenatal services: for example, only 40.2% of low educated women attended the course preparing for birth, against 62.6% of women with a university degree. Instead, no great differences emerged between Italian women and women coming from non-Western countries (81.8% and 81.1% of women had a good or excellent evaluation, respectively), whereas women coming from Western countries were less satisfied (the same percentage amounted to 73.6%).

Satisfaction during delivery differed only slightly by educational level: from 81.5% satisfied among low educated women to 82.8% of medium educated ones. Once again, the differences

between Italian and foreign, non-Western women were minimal, but they were more substantial if compared to women coming from Western countries.

Finally, medium educated women were the most satisfied of postpartum services, as for delivery. Only minor differences by educational level were detected. Also in postpartum, women coming from Western countries consistently remained the least satisfied among the group.

Table 10.2 – Overall satisfaction during pregnancy, delivery and postpartum by education and citizenship.

	Education			Citizenship		
	Low	Medium	High	Italian	Non-Western country	Western country
Pregnancy overall satisfaction						
Very poor	3	8	7	17	1	0
Poor	16	53	20	77	10	2
Fair	134	334	245	640	61	12
Good	302	1226	1098	2395	201	30
Excellent	137	457	427	904	108	9
Delivery overall satisfaction						
Very poor	8	30	34	67	4	1
Poor	14	75	73	152	10	0
Fair	91	263	231	515	57	13
Good	253	986	807	1861	160	25
Excellent	244	784	705	1557	160	16
Postpartum willingness to recommend						
Definitely no	35	102	103	214	22	4
Maybe	87	299	288	587	76	11
Definitely yes	461	1644	1382	3170	281	36

Source: own elaboration on survey data.

CHAPTER 11 ANALYTICAL STRATEGY

Two steps composed the analytical approach. First, the ecometric technique was applied to the items of "intermediate" satisfaction, in order to catch the variability of this latent variable which could not be attributed to individuals, and thus obtain a scale measurement of "intermediate" satisfaction at the contextual level. Second, multilevel proportional odds models were estimated, in which the items of "overall" satisfaction were used as the response variable and the scale measurements of "intermediate" satisfaction were treated as second-level covariates.

11.1 Scale measurements through ecometrics

In the first step of the analysis, the data structure for ecometrics was as follows: the items were the lowest level, nested within women, who in turn were nested within health districts or hospitals, the highest level. The individual pieces of information, which needed to be aggregated to the highest level, were items regarding women's satisfaction and impression towards specific services – namely, items of intermediate satisfaction.

In such a way, several items could be combined in just one synthetic measure through the estimation of the following three-level linear model[23]:

(6) $$y_{ijk} = \beta_0 + \sum_{m=1}^{q-1} \beta_m D_{mjk} + v_k + u_{jk} + e_{1jk} + .. + e_{qjk}$$

where y_{ijk} is the response to item i of respondent j in the health district/hospital k, β_0 is the intercept, q is the number of items (one of which used as the reference), D are the q-1 item dummies, whereas the remaining terms represent the errors by level, and more precisely:

(7a) Health district/hospital level: $v_k \sim N(0, \Omega_v)$, $\Omega_v = [\sigma_{v0}^2]$

(7b) Individual level: $u_{jk} \sim N(0, \Omega_u)$, $\Omega_u = [\sigma_{u0}^2]$

(7c) Item level: $\begin{bmatrix} e_{1jk} \\ \cdot \\ e_{qjk} \end{bmatrix} \sim N(0, \Omega_e)$, $\Omega_e = \begin{bmatrix} \sigma_{e1}^2 & & \\ . & . & \\ 0 & . & \sigma_{eq}^2 \end{bmatrix}$

[23] A multilevel model for continuous data is commonly used and accepted in the literature as the first step of the ecometric approach. Given that the response variables are items with five categories, the bias introduced using a multilevel model for continuous variables instead of a model for ordinal variables should be only modest (Grilli and Rampichini 2011).

The error terms were assumed to have a Normal distribution and to be independent of the other error terms. At the first level, each item had its own error term, and independent of any other: therefore, the unexplained variability attributed to each item could vary.

Then, the reliability score λ was computed in order to evaluate how well the individual items of a scale measured the underlying concept of the scale (see Equation 3 for the details).

In the ecometric model for pregnancy, items (q=2) at the lowest level were nested within women[24] (J=4,467), who in turn were nested within health district-areas (K=34). The two questions investigated women's opinion about the presentation of the birth path and the services offered by the Local Health Authority, and their satisfaction towards the course preparing for birth.

Conversely, the ecometric model for delivery took into account three items (q=3), nested within women (J=4,598), nested within hospitals (K=25). In this model, the three items measured the confidence that women had in the doctors, nurses and midwives who assisted them during hospitalization.

Finally, we attempted the ecometric model also for the perinatal period, using four items at the lowest level (q=4) and regarding the help mothers received from counselling staff (doctors and midwives) and from general practitioners and paediatricians, each of them with five response categories. Nevertheless, the ecometric model had a reliability coefficient under the commonly accepted threshold of 0.6, perhaps because of the high non-response rate to these questions per ecological unit. We therefore decided to omit the ecometric model for postnatal period, and to estimate directly the multilevel model for ordinal variables, where 4,401 respondents constituted the lowest level[25] nested in the 34 health districts.

Through these multilevel models, the items of intermediate satisfaction towards prenatal services and delivery were combined in one measure referred to their contextual level, respectively. This synthetic scale was formed by the third level residuals v_k, which constituted the measurement of women's satisfaction towards specific services at the health district/hospital level, namely the variability in measuring satisfaction that could not be attributed to individual response, but to the context.

Thus, the health district/hospital residuals could be used in the subsequent multilevel proportional odds models as a covariate to explain the overall satisfaction towards the prenatal services, and the childbirth. In this way, a contextual variable – a scale – at a higher-level unit based

[24] 4467 women correspond to the number of women who answered to the questionnaire and were resident in Tuscany.
[25] The number of respondents differs for each model because in the prenatal and postnatal models we excluded the women who did reside in the Tuscany region. Moreover, some women did not benefit from postnatal services, and these women were obviously not included in the perinatal model.

on several related individual variables was constructed, and then implemented in the following multilevel model as a covariate (see Mohnen et al. 2011).

The use of the ecometric approach proved advantageous. First, I wanted to use a multi-item, and not a single-item, strategy, which is notoriously less effective (see e.g. McIver and Carmines 1981). Second, the combination of all items in a unique scale was avoided, given that each item aimed at catching different traits of the underlying latent variable. More precisely, all the items measuring the satisfaction towards specific services were used as an instrument to explain the overall satisfaction in that phase. Doing so, the individual satisfaction towards each period – pregnancy, delivery, and post-partum – could be explained averaging out the common component of satisfaction that was attributable to the context (namely, the hospital or the health district), separately for specific services and for the overall evaluation. In such a way, the satisfaction towards the birth path could be analysed according both to an individual and a contextual dimension.

11.2 Multilevel modelling of overall satisfaction

To meet the research objective, namely the assessment of women's satisfaction towards the "Path to Safe Birth" of Tuscany, in the second step we estimated multilevel proportional odds models, namely random intercept proportional odds models, according to the ordinal nature of the items. As seen above, multilevel models are widely used in health care. Random intercept proportional odds models allow researchers to take into account the ordinal nature of the response, taking advantage of the information on ordering between categories, and avoiding the arbitrariness of scoring systems. Even more, women's satisfaction depends not only on the personal traits and expectations of the woman, but also on the characteristics of the health services and the received assistance: thus, to properly assess women's satisfaction, a multilevel model, which took into account the hierarchical structure of the phenomenon, was well suited. Finally, the application of multilevel models dealt with the unbalance of individuals within hospitals/health districts that responded to the questionnaire, depending on the different size of the population living there, or as a result of selective non-response.

In this case, two levels composed the hierarchical structure. Women formed the first level; hospitals (when the purpose was to assess delivery performances), or local health authorities (for pregnancy and postpartum period evaluation) constituted the second level.

In order to disentangle the association between socio-demographic factors and satisfaction in the various stages of the path, separate models were estimated for pregnancy, delivery and postpartum. First level units are all interviewed women (N=4,598) in the model for childbirth, whereas we

excluded 131 women resident outside Tuscany in the other two models. For delivery, the analysis was repeated only considering those women who resided in Tuscany, adding as a covariate the overall satisfaction towards prenatal services (not available for non-resident women). At the same time, the second level was constituted by 34 health districts (for pregnancy and postpartum period evaluation), or by 25 hospitals (to assess delivery).

The response variable was the overall satisfaction towards services and assistance during pregnancy, during delivery (both with C=5 categories), and willingness to recommend services and assistance during post-partum period (with C=3 categories). Thus, the models were formed by C-1 equations of the following form:

$$(8) \qquad g(\gamma_{cij}) = \alpha_c - (X'_{ij}\beta + u_j), \quad c = 1, .., C-1$$

where γ_{cij} is the cumulative probability up to the cth category for unit *i* in cluster *j* (i.e. health district or hospital), $\gamma_{cij} = \Pr(Y_{ij} \leq y_c)$. α_c is the specific threshold for the cth cumulative probability, which can be interpreted as the mean of the cth cumulative probability among all clusters. X_{ij} is the vector of first- and second- level covariates; first-level covariates concerned women's socio-demographic characteristics, clinical conditions and service utilizations, whereas second-level covariates included clinical evaluations about health districts/hospitals and scale measurements on women's intermediate satisfaction at the cluster level (see sections 10.2.1 and 10.2.2 for an exhaustive list of the explanatory variables). Finally, u_j is the random effect for cluster *j*, which represents the unobserved variability at the cluster level, and which is distributed as a Normal variable $u_j \sim N(0, \sigma_u^2), \forall j = 1, 2, .., C-1$.

In the model for childbirth, we added also some interaction terms between education/citizenship and women's clinical or experience variables.

Overall, the main interest laid in the estimate of the effects of socio-demographic factors on women's satisfaction towards the birth path. If the nested structure of the data had been ignored, the individual variability would have been underestimated, thus yielding incorrect results.

For this reason, the analyses began with the estimation of the random intercept cumulative model without covariate, and with the comparison of this with the corresponding model without random effects, in order to verify whether there was evidence of unobserved heterogeneity at the cluster level. Then, in case of positive evaluation, the analyses proceeded with the estimation of sequential models. Indeed, to take into account the potential influence of first- and second-level covariates on the socio-demographic characteristics of the woman, several models with increasing complexity were estimated, in which first- and second-level covariates were gradually introduced.

By comparing the results obtained with increasing complexity, the explanatory variables were controlled for correlation.

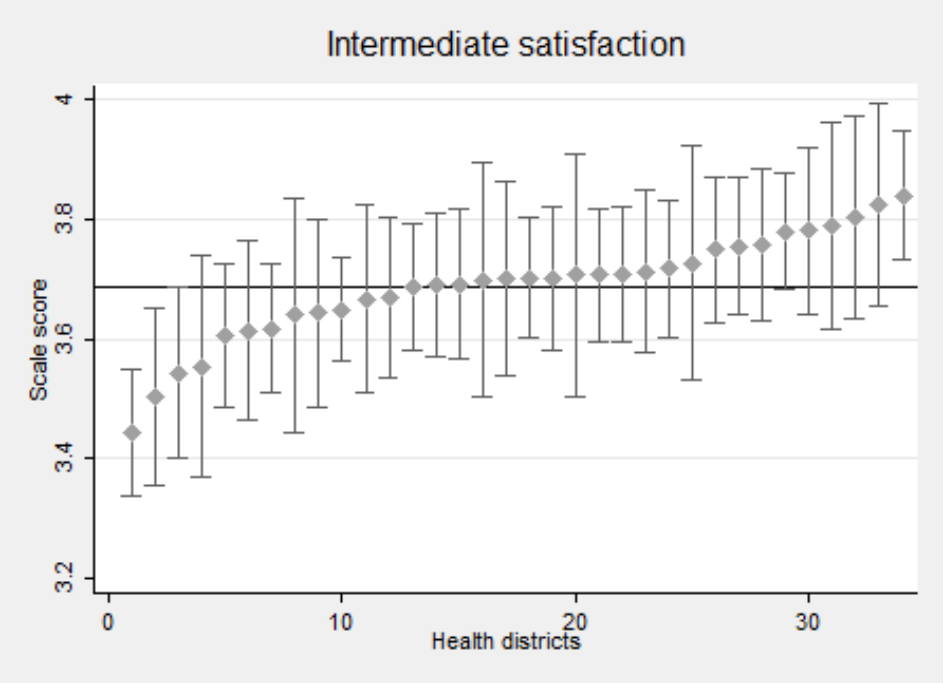
CHAPTER 12 RESULTS

12.1 Ecometrics: measurement scales

Through the ecometric model, the scale measurement of women's satisfaction towards specific prenatal services at health district level was estimated. Scales (namely, residuals at the health district level) summed with the estimated intercept represented an estimate of women's intermediate satisfaction during pregnancy for each district. For this evaluation, variations among clusters were minimal: on a scale ranging between 1 and 5, all health districts were over 3, with a range of 0.397 between the minimum of 3.443 and the maximum of 3.840 (see Figure 12.1).

Then, the reliability coefficient of 0.71, well above the commonly accepted threshold (0.60), corroborated the hypothesis that the scale measurement was effectively measuring the underlying latent trait.

Figure 12.1 Confidence intervals and point estimates for the scale scores of intermediate satisfaction towards prenatal services per health district.

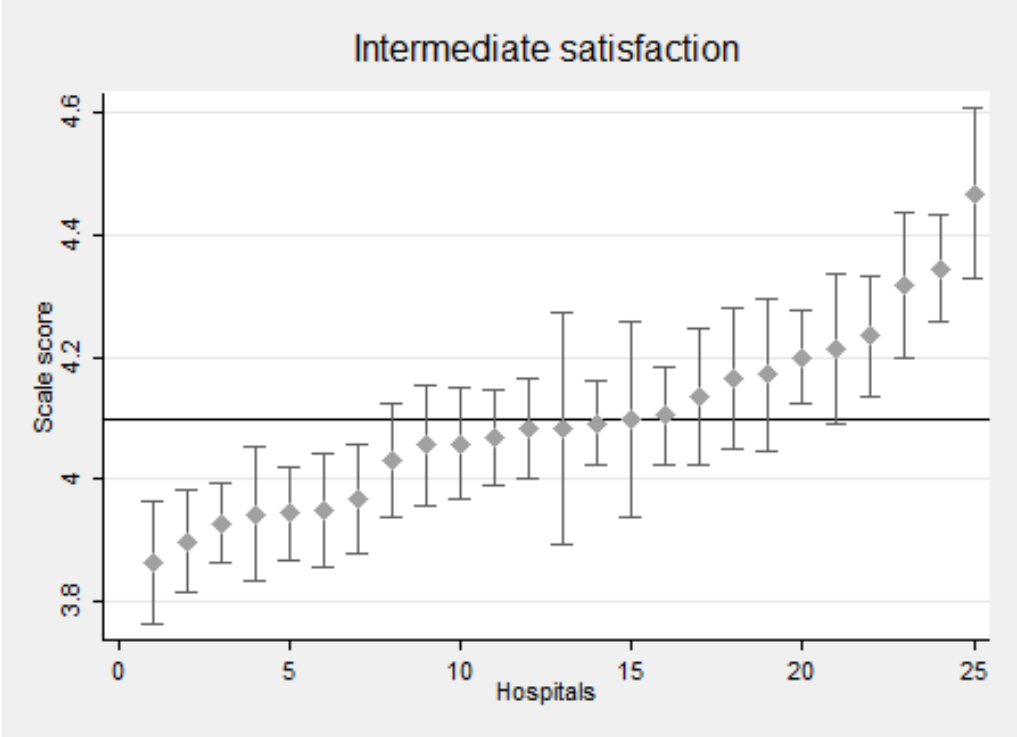


With the second ecometric model for delivery, the scale measurement of women's intermediate satisfaction was estimated through their confidence in the doctors, nurses and midwives they met during the recovery in the hospital.

These scales - the residuals at the hospital level - summed with the estimated intercept represented an estimate of the women's intermediate satisfaction during delivery for each hospital. In this case, the variability between clusters was slightly higher than in the previous model, and so was their average evaluation: on a scale from 1 to 5, the majority of hospitals were over 4, with a range of 0.602 between the minimum of 3.865 and the maximum of 4.467 (Figure 12.2).

The very high reliability coefficient for the second ecometric model (0.92) corroborated the hypothesis that the scale measurement was effectively measuring the underlying latent trait of intermediate satisfaction towards assistance during delivery.

Figure 12.2 Confidence intervals and point estimates for the scale scores of intermediate satisfaction during delivery per hospital.



12.2 Pregnancy

Table 12.1 shows model results for women's overall satisfaction towards services and assistance during pregnancy. Models with and without random effects were compared, to test whether the health district variance was significant; the LRT (Likelihood Ratio Test) statistic ($t = 11.08, pvalue = 0.0004$) fully justifies the implementation of a multilevel proportional odds model instead of a simple proportional odds model, thus corroborating the hypothesis of unobserved heterogeneity at health district level.

The main interest was to clarify which socio-demographic factors (if any) were associated with satisfaction during pregnancy. First, women's overall satisfaction increased with age, but not linearly. Second, while foreign women coming from non-Western countries were usually more satisfied than Italian women, the opposite was true for foreign women coming from Western countries. Then, a positive correlation was found between the level of education and the woman's satisfaction, which increased with educational attainment. Finally, the only non-significant socio-demographic covariate was the number of previous pregnancies, which did not seem to influence women's satisfaction towards prenatal services and assistance[26].

Among the second-level covariates, only women's satisfaction towards specific prenatal services (i.e. the residuals from ecometric model) was significant. Its estimated coefficient indicated – as expected - that a greater satisfaction towards specific prenatal services positively influenced overall satisfaction. Thus, its components - the introduction of the birth path and the services offered by her Local Health Authority; and the course preparing for birth - conditioned directly the overall assessment of the prenatal services. Even dropping this variable, the other two second-level covariates, which reflected the diffusion and the proactivity of prenatal services throughout districts, remained non-significant.

Taking into account second-level random effects, the predicted, conditional probabilities were estimated for the baseline model (i.e. assuming that the random effect u_j equalled zero, which represent the predicted probabilities for a cluster with a mean level of satisfaction), and for two other hypothetical clusters: one with a low level of satisfaction (supposing it reflected a worse quality of prenatal services) and the other with a high level of satisfaction (supposing it reflected a better quality of services). In all cases, the reference woman was a 35 year-old, medium educated Italian woman, at her first physiological pregnancy, who has not visited the hospital before delivery, who did three or more echography, and who had answered the postal questionnaire. Graph 12.3 shows how the baseline predicted probabilities ($u_j = 0$) change with age when the level of satisfaction moves from average to lower ($u_j = -1.96\sigma_u$) or to higher levels ($u_j = +1.96\sigma_u$).

Table 12.2 shows that for all three cluster the highest predicted probability is always the fourth category, which increases as satisfaction grows. However, differences are not large, because a high level of satisfaction was widespread in all health districts. This is confirmed by the predicted probabilities for the different values of the socio-demographic covariates (Table 12.2 and Figure 12.3), which show how personal traits (in particular, age and citizenship) influence women's overall satisfaction more than the health district of residence.

[26] Even excluding age from the model, this covariate still remained not significant.

Table 12.1 – Estimates and standard errors for the random intercept proportional odds model on the overall satisfaction towards services and assistance during pregnancy.

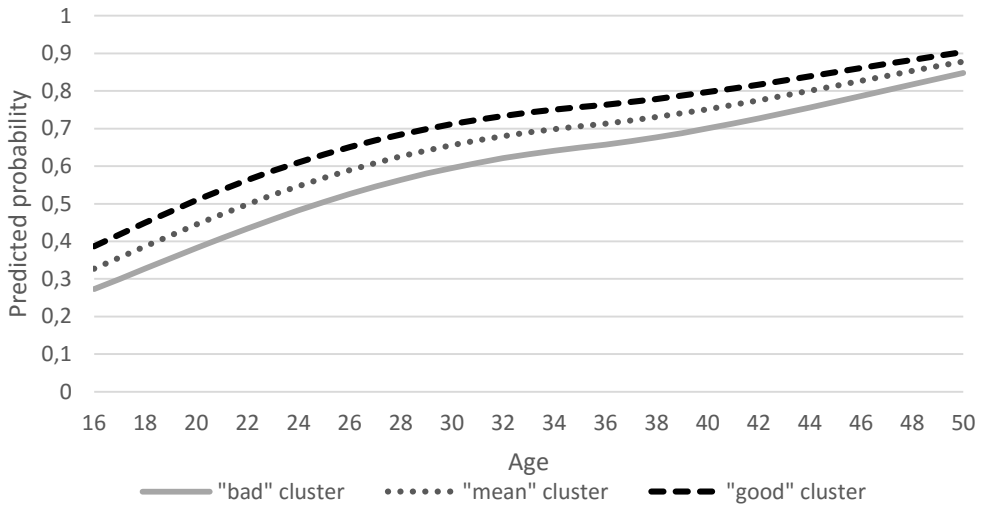
Response	**Overall prenatal satisfaction**								
Units: health district	34			34			34		
Units: woman	4467			4467			4467		
	Model 1	S.E.		Model 2	S.E.		Model 3	S.E.	
Fixed Part									
Thresholds									
First	-5.446	0.242	***	-5.388	0.245	***	-4.913	0.454	***
Second	-3.641	0.111	***	-3.583	0.117	***	-3.108	0.400	***
Third	-1.412	0.066	***	-1.351	0.076	***	-0.876	0.390	**
Fourth	1.335	0.065	***	1.403	0.076	***	1.879	0.392	***
Patient demographics									
Age (centred at the median age)	0.030	0.007	***	0.032	0.007	***	0.033	0.007	***
Age^2 (centred at the median age)	0.003	0.001	***	0.003	0.001	***	0.003	0.001	***
Citizenship (Ref. Italian)									
Strong migratory country	0.288	0.112	***	0.312	0.113	***	0.313	0.113	***
Western Country	-0.515	0.272	**	-0.546	0.273	**	-0.539	0.274	**
Education (Ref. Medium)									
Low	-0.212	0.095	**	-0.190	0.095	**	-0.192	0.095	**
High	0.176	0.064	***	0.163	0.064	**	0.162	0.064	**
Number of previous pregnancies	-0.018	0.026		-0.012	0.026		-0.012	0.026	
Patient experience and clinic									
Has visited the birth centre				0.111	0.061	*	0.112	0.061	*
Pathological pregnancy				-0.173	0.089	*	-0.177	0.089	*
Number of echographies under recommendation				0.147	0.154		0.143	0.154	
Health-district characteristics									
Scale of intermediate satisfaction[a)]							1.197	0.509	**
Random Part									
Level: health district									
Variance	0.025	0.013		0.029	0.014		0.017	0.011	

Notes:
a) The scale of intermediate satisfaction is given by third level residuals of the ecometric model.
From Model 2 we controlled also for another individual-level covariate, the typology of response to the questionnaire, but it was not significant.
In Model 3 we controlled also for other two health-district covariates, the access rate to the counselling of childbearing-age women and the % of prenatal screening, but they were not significant.
* p-value<0.10, ** p-value<0.05, *** p-value<0.01

Table 12.2 – Predicted probabilities $\hat{\pi}_c$ of the 5 categories (1=very poor to 5=excellent) for satisfaction towards prenatal services, according to chosen covariates and second-level random errors.

	$\hat{\pi}_1$	$\hat{\pi}_2$	$\hat{\pi}_3$	$\hat{\pi}_4$	$\hat{\pi}_5$
Woman socio-demographics					
Citizenship (Ref. Italian)					
Strong migratory country	0.005	0.026	0.202	0.594	0.173
Western Country	0.012	0.059	0.345	0.502	0.082
Education (Ref. Medium)					
Low	0.009	0.043	0.284	0.553	0.112
High	0.006	0.030	0.225	0.586	0.152
Health district performance					
Worse quality of services ($-1.96\sigma_u$)	0.009	0.045	0.296	0.544	0.105
Mean quality of services (baseline)	0.007	0.035	0.251	0.573	0.133
Better quality of services ($+1.96\sigma_u$)	0.006	0.028	0.210	0.591	0.165

Figure 12.3 – Predicted probability of positive evaluation (*excellent* and *good*) of prenatal services according to age in three typical health districts, with bad quality of services ($u_j = -1.96\sigma_u$), mean quality of services ($u_j = 0$), and good quality of services ($u_j = +1.96\sigma_u$)



12.3 Delivery

As for prenatal services, the null models with and without random effects were compared: once again, the LRT statistic ($t = 126.10, pvalue = 0.0000$) fully justified the implementation of a multilevel proportional odds model instead of a simple proportional odds model.

The results for women's overall satisfaction towards services and assistance during delivery slightly differed from the previous ones (satisfaction results towards pregnancy), especially with regard to the socio-demographic factors. Indeed, only the citizenship was significant in the first model. Adding the covariates pertaining to the woman's experience and clinic conditions, the significance of two socio-demographic covariates slightly changed. In Model 2 some interaction terms between education/citizenship and women's clinical or experience variables were added, in order to understand this association more deeply. To sum up, citizenship was associated with women's satisfaction in the same direction as it was for pregnancy (lower satisfaction for foreign, western women). Instead, the influence of education seemed to depend on some clinical aspects. For example, better-educated women were less satisfied if they had not had an appropriated pain control. In short, highly educated women appear to be a more demanding group: they tended to show appreciation if their expectations had been fulfilled, and to express criticism if the opposite case. This hypothesis is corroborated, for example, by the percentage of women who asked about the possibility of receiving epidural anaesthesia during childbirth: 56.8% among the high educated, and just 44.9% among the low educated. This difference (11.9%), however, declined to only 2.3% when it came to actually practising epidural anaesthesia, and this divergence could justify their stronger link between satisfaction and pain control.

Women's clinical and experience covariates were nearly all significant. Having a Caesarean section, for instance, was negatively associated with satisfaction, compared to a vaginal delivery. A lack of information about breastfeeding – or inconsistent information coming from the staff -, as well as an insufficient pain control, the feeling of loneliness during labour or delivery, and the privation of skin-to-skin contact after delivery were all factors that lowered women's satisfaction. Thus, the woman's experience during recovery and delivery appeared more incisive for the overall satisfaction than socio-demographic characteristics.

Then, looking at hospital-level covariates, women's confidence in the hospital staff (i.e. the residuals from the ecometric model) was significant, whereas the percentage of women who breastfed within 2 hours from delivery in the hospital was not. To sum things up, the hospital in which the delivery took place seemed to matter more substantial than the districts where women lived during their pregnancy for the overall satisfaction.

The same model for delivery was replicated adding the information about the overall satisfaction towards prenatal services, but only for the women who resided in Tuscany (Appendix B2). This new model confirmed the previous results: the significance of nearly all coefficients remained unaltered through the models of increasing complexity. Moreover, the high significance of prenatal overall satisfaction on delivery satisfaction could reflect the positive implications that satisfaction

towards prenatal services had on the choice of the hospital for delivery, and on women's recovery experience and satisfaction themselves.

Taking into account second-level random effects, we estimated the predicted, conditional probabilities for the baseline model and for two other hypothetical clusters, as we did in the prenatal model. In all cases, the reference woman was a 35 year-old, medium educated Italian woman, at her first physiological pregnancy, who had a term, vaginal delivery, in her Local-Health Authority of residence, with an appropriate pain control, who had received information about breastfeeding, did not feel herself alone during labour or delivery, and was together with her new-born during hospital stay, and who answered the postal questionnaire. Table 12.4 shows that the highest predicted probability was always the fourth category for a typical cluster with low, mean or high levels of satisfaction. Nevertheless, in comparison to the previous model, differences among the three clusters are more substantial, thus showing again a greater impact of the hospital performance on women's satisfaction.

Table 12.3 – Estimates and standard errors for the random intercept proportional odds model on the overall satisfaction towards services and assistance during delivery.

Response	**Overall delivery satisfaction**								
Units: hospital (birth centre)	25			25			25		
Units: woman	4598			4598			4598		
	Model 1	S.E.		Model 2	S.E.		Model 3	S.E.	
Fixed Part									
Thresholds									
First	-4.267	0.151	***	-6.631	0.176	***	-4.865	1.296	***
Second	-3.046	0.115	***	-5.268	0.142	***	-3.503	1.291	***
Third	-1.631	0.100	***	-3.517	0.123		-1.751	1.290	
Fourth	0.461	0.097	***	-0.751	0.108		1.014	1.289	
Patient demographics									
Age (centred at the median age)	0.010	0.006		0.007	0.006		0.007	0.006	
Citizenship (Ref. Italian)									
Strong migratory country	0.108	0.104		0.434	0.144	***	0.439	0.144	***
Western Country	-0.434	0.248	*	-0.090	0.337		-0.083	0.337	
Education (Ref. Medium)									
Low	0.101	0.088		0.053	0.157		0.055	0.157	
High	0.056	0.061		0.188	0.109	*	0.193	0.109	*
Number of previous pregnancies	0.000	0.024		-0.023	0.026		-0.024	0.026	
Patient experience and clinic									
Type of delivery (Ref. Vaginal)									
Assisted (with cupping glass or forceps)/Induced				-0.083	0.114		-0.078	0.114	
Scheduled Caesarean section				-0.655	0.138	***	-0.655	0.138	***
Not scheduled Caesarean section				-0.485	0.148	***	-0.483	0.148	***
Accordant information about breastfeeding (Ref. Yes)									
Somewhat				-1.018	0.070	***	-1.006	0.070	***
No				-2.080	0.099	***	-2.061	0.099	***
No information				-2.187	0.131	***	-2.159	0.131	***
Pain control (Ref. Yes)									
Somewhat				-0.898	0.096	***	-0.890	0.096	***
No				-1.469	0.153	***	-1.469	0.153	***
Alone during labour or delivery				-1.132	0.160	***	-1.135	0.160	***
No skin-to-skin contact after delivery				-0.354	0.093	***	-0.345	0.093	***
PSA citizenship # Assisted delivery[a)]				-0.872	0.293	***	-0.890	0.292	***
High education # Assisted delivery[a)]				0.293	0.169	*	0.289	0.169	*
Low education # Alone during labour or delivery[a)]				0.607	0.337	*	0.604	0.338	*
High education # Somewhat pain control[a)]				-0.319	0.140	**	-0.326	0.139	**
High education # No pain control[a)]				-0.578	0.216	***	-0.570	0.216	***
Hospital characteristics									
Scale of intermediate satisfaction[b)]							1.735	0.394	***
Random Part									
Level: hospital									
Variance	0.173	0.058		0.113	0.042		0.045	0.021	

Notes:
a) For interaction terms, only significant values are reported on the table.
b) The scale of intermediate satisfaction is given by third level residuals of the ecometric model.
From Model 2 we controlled also for other four individual-level covariates, preterm delivery, the out-of-Local Health Authority delivery, if the mother and newborn were together during hospital stay, and the typology of the questionnaire, but they were not significant.
In Model 3 we controlled also for another hospital-level covariate, the percentage of breastfeeding within 2 hours from delivery, but it was not significant.
* p-value<0.10, ** p-value<0.05, *** p-value<0.01

Table 12.4 – Predicted probabilities $\hat{\pi}_c$ for chosen random errors for the model on the overall satisfaction towards services and assistance during delivery.

	$\hat{\pi}_1$	$\hat{\pi}_2$	$\hat{\pi}_3$	$\hat{\pi}_4$	$\hat{\pi}_5$
Health district performance					
Worse quality of services ($-1.96\sigma_u$)	0.012	0.032	0.164	0.599	0.193
Mean quality of services (baseline)	0.008	0.022	0.119	0.586	0.266
Better quality of services ($+1.96\sigma_u$)	0.005	0.014	0.083	0.543	0.355

12.4 Post-partum period

As in the previous models, we compared the null models with and without random effects, to test whether the health district variance was significant. Also in this case, the LRT statistic ($t = 10.79, pvalue = 0.0005$) justified the implementation of a multilevel proportional odds model, thus giving evidence of unobserved heterogeneity at health district level.

Results for women's willingness to recommend postpartum services, representative of women's satisfaction towards services, are reported in Table 12.5. The satisfaction towards the services received was associated with two socio-demographic characteristics of the woman: citizenship, with a lower level of satisfaction for women coming from non-Western countries, and the educational level, where highly educated women seemed to be less satisfied.

Looking at the covariates, which reflect the woman's clinical conditions and experience, only the satisfaction towards the previous stages, pregnancy and delivery, was associated with the willingness to recommend postpartum services. Unsurprisingly, as the satisfaction towards the previous phases increased, so did that for postnatal services. Consequently, the woman's clinical condition during childbirth – such as the typology of delivery or having had a preterm delivery - did not seem associated with satisfaction in the postnatal period. Unfortunately, we were not able to add any covariates on the newborn's health, which could have influenced the mother's satisfaction towards postnatal services.

Among the second-level covariates, only one proved significant: the percentage of women who accessed at least once the counselling during postpartum in the health district, which increased together with the willingness to recommend those services. Therefore, the extensiveness and receptiveness of counselling services throughout the district seemed a key element for their approval. This results confirm the expectation that postnatal services are not much known and attended by women in the region, but they show how a greater satisfaction is directly related to a greater involvement in accompanying and helping mothers during postpartum.

Finally, we estimated the predicted, conditional probabilities for the baseline model, namely the mean cluster, and for two other hypothetical clusters, a good one and a bad one. The reference woman was a 35 year-old, medium educated Italian woman, at her first physiological pregnancy, who had a term, vaginal delivery, who was on average satisfied during pregnancy and delivery, and who answered the postal questionnaire. For all three clusters, the highest predicted probability was always the third (and last) category, positively related to the willingness to recommend the service. Differences among typical clusters emerged, implying that the health district influenced women's satisfaction, more than for prenatal services. On the contrary, the predicted probabilities for the different values of citizenship or education had smaller deviations compared to those of the context. For postpartum period, the place of residence played a relevant role in defining women’s satisfaction.

Table 12.5 – Estimates and standard errors for the random intercept proportional odds model on the willingness to recommend services and assistance during the postnatal period.

Response	**Willingness to recommend post-partum services**								
Units: health district	34			34			34		
Units: woman	4401			4401			4401		
	Model 1	S.E.		Model 2	S.E.		Model 3	S.E.	
Fixed Part									
Thresholds									
First	-2.961	0.094	***	-2.287	0.144	***	-1.900	0.210	***
Second	-1.436	0.075	***	-0.704	0.134	***	-0.317	0.204	
Patient demographics									
Age (centred at the median age)	0.010	0.008		0.007	0.008		0.006	0.008	
Citizenship (Ref. Italian)									
Strong migratory country	-0.290	0.128	**	-0.363	0.132	***	-0.374	0.132	***
Western Country	-0.458	0.309		-0.347	0.318		-0.321	0.318	
Education (Ref. Medium)									
Low	-0.054	0.117		-0.047	0.120		-0.051	0.120	
High	-0.161	0.081	**	-0.201	0.083	**	-0.200	0.083	**
Number of previous pregnancies	0.053	0.034		0.047	0.035		0.043	0.035	
Patient experience and clinic									
Overall pregnancy satisfaction (Ref. Fair)									
Very poor				0.205	0.541		0.275	0.541	
Poor				-0.535	0.238	**	-0.540	0.237	**
Good				0.396	0.100	***	0.392	0.100	***
Excellent				0.915	0.139	***	0.907	0.139	***
Overall delivery satisfaction (Ref. Fair)									
Very poor				-0.703	0.275	**	-0.705	0.274	**
Poor				-0.256	0.191		-0.264	0.191	
Good				0.396	0.110	***	0.390	0.110	***
Excellent				0.783	0.124	***	0.784	0.124	***
Health-district characteristics									
% of women who access at least one time to the counselling during post-partum							0.006	0.002	***
Random Part									
Level: health district									
Variance	0.043	0.023		0.040	0.023		0.009	0.015	

Notes:
From Model 2 we controlled also for other three individual-level covariates, preterm delivery, the typology of delivery and the typology of response to the questionnaire, but they were not significant.
In Model 3 we controlled also for another health-district covariates, the access rate to the counselling of childbearing-age women, but it was not significant.
* p-value<0.10, ** p-value<0.05, *** p-value<0.01

Table 12.6 – Predicted probabilities $\hat{\pi}_c$ for chosen covariates and random errors for the model on the willingness to recommend services and assistance during the postnatal period.

	$\hat{\pi}_1$	$\hat{\pi}_2$	$\hat{\pi}_3$
Woman socio-demographics			
Citizenship (Ref. Italian)			
Strong migratory country	0.179	0.336	0.486
Western Country	0.171	0.330	0.499
Education (Ref. Medium)			
Low	0.136	0.298	0.566
High	0.155	0.316	0.529
Health district performance			
Worse quality of services ($-1.96\sigma_u$)	0.153	0.315	0.533
Mean quality of services (baseline)	0.130	0.291	0.579
Better quality of services ($+1.96\sigma_u$)	0.110	0.266	0.623

Comparing the results obtained by the models for each phase, some differences and similarities emerged. Looking at the socio-demographic covariates, two of these happened to be significant for all the models, namely the citizenship and the educational attainment, but they did not always give the same results. During pregnancy and at childbirth, women coming from non-Western countries were more satisfied than Italian women, whereas the situation was more complex for high-educated women. Instead, during postpartum the situation was reversed, with a lower satisfaction of the first two groups.

Some hypotheses could be advanced to explain this contrasting result. Compared to services offered during pregnancy, the receptiveness of counselling services after delivery is weaker, and fewer women accessed to the counselling during post-partum than during pregnancy. For this reason, the satisfaction of the women who were more involved in the services during pregnancy could be negatively affected in the post-partum, because they could demand for greater support even in this phase. Highly educated women seemed to participate more actively than others in the services offered during pregnancy, such as the course preparing for birth; and this discrepancy could explain their higher satisfaction during prenatal services and lower appreciation of the postpartum phase. Nevertheless, a deeper understanding is necessary to comprehend this peculiarity.

The number of previous pregnancies was never significant. Instead, a greater satisfaction at each phase typically produced better results at the following stage. As a consequence, a key element to succeed seemed to give a high quality of services during pregnancy, which could help women to

better face this important stage of their lives, and to prepare them to tackle the following period with greater awareness and useful information.

CHAPTER 13 CONCLUDING DISCUSSION

This study draws attention to the evaluation of the satisfaction of users of the birth path, through their experience during pregnancy, at childbirth and in the early postnatal period in the Tuscany region.

The first issue that deserved attention was to clarify what socio-demographic factors (if any) - such as the educational attainment, the age of the woman giving birth, her citizenship, and the number of her previous pregnancies - were associated with satisfaction during pregnancy, childbirth, and post-partum. Previous studies on this topic are scarce and the link they find between women's satisfaction and their socio-demographic characteristics is not always straightforward. One of the aims of the work was to address the inconsistencies found in previous research and, with the use of separate models, disentangle the association in the different phases of the process. Even more, attention was paid to the context in which a woman lived or the hospital in which a woman gave birth, in order to clarify the possible association existing between peculiar characteristics of the context/hospital and the woman's satisfaction. For attaining this objective, the hierarchical structure of the data, which was explicitly taken into account, was confirmed by the models.

The results confirm the importance of socio-demographic factors in explaining women's satisfaction. Moreover, it depends on the phase of the birth path. For prenatal period, the socio-demographic characteristics of the woman have a great impact on her satisfaction towards the services and the assistance during this phase. Satisfaction increases with age, even if not monotonically. Instead, contrary to previous studies, a positive association between satisfaction and education was found. Then, the link between citizenship and satisfaction had not been previously investigated, to the best of my knowledge. In this study, an increasing satisfaction for women who came from non-Western countries is found, whereas women from Western countries are less satisfied than Italians. On the contrary, contextual covariates are not significant, thus underlying a greater importance of socio-demographic characteristics of the woman than the context in which she lived.

During delivery, the influence of socio-demographic covariates is attenuated. Both the citizenship and the educational level are significant, and give results that are similar to those for the prenatal period, whereas age does not seem to matter, as found in some previous studies. The woman's clinical covariates, as well as those related to the woman's experience during recovery, together with contextual covariates, are clearly significant, thus playing a central role in women's satisfaction at childbirth. In conclusion, during the recovery for delivery, the woman's clinical

conditions, as well the hospital in which she gave birth, influence her satisfaction, whereas the importance of socio-demographic factors appears weaker.

In the postnatal period, among the socio-demographic factors citizenship and education are once again associated with satisfaction, but in an unexpected way. Contrary to what was found for the prenatal period, satisfaction is lower among foreign women coming from non-Western countries, and also among highly educated women. At the same time, women tend to recommend postnatal services if they are satisfied in the prenatal phase, and during recovery for delivery. Finally, the context partly conditions their willingness to recommend services. In conclusion, postnatal services seem somehow influenced by the women's experience during pregnancy and delivery. If they had a positive experience with services and assistance, they tend to confirm this evaluation; otherwise, they probably do not. Nevertheless, given the relative importance of the context (the model showed that the higher is the percentage of women who accessed counselling during postpartum, the higher is their satisfaction) and the limited number of women involved in many postnatal services[27], the receptivity of the context seems to be a key element for approaching women towards postnatal services, and for the satisfaction of these services. Even more, the greater difficulty of getting close to immigrant women could explain their lower satisfaction towards this kind of services.

This study contributed to a better understanding of the association between the women's socio-demographic characteristics and their satisfaction towards maternity and counseling services. One may wonder if these associations can be generalized and explain the inconsistencies found in previous findings. The phase of the process has been explicitly taken into account, and appears to be important in the evaluation of women's satisfaction, even if not crucial. Looking at all models together, and focusing on socio-demographic covariates, the general conclusion emerges that the birth order is not significantly associated with the woman's satisfaction. The woman's age emerges as the only variable that is significant during pregnancy, but not at delivery and during postpartum: even in this case, this discrepancy could justify the contrasting results found in the literature. Moreover, the prenatal association between age and satisfaction could be driven by the special attention that the Tuscany region devotes to thirty-five and older pregnant women: thus, a tentative conclusion could be that all in all age and satisfaction are scarcely associated, if at all. The woman's citizenship and her educational level seem to be the only variables that play a crucial role in their satisfaction. Nevertheless, the contrasting results found for the postnatal model compared to pregnancy and childbirth require some in-depth analyses and need to be addressed more specifically, because they could reveal a critical situation of counselling services during postpartum.

[27] See Appendix B1 for details on the covariate about women who attended postnatal services.

Or it could partly explain the lack of influence found in some previous studies, which did not disentangle the different phases of the process.

Both the influence of age on the women's satisfaction, as well as the effect of citizenship and education on it should be addressed by health authorities and decision makers, because the quality of maternity services appears to be differently perceived according to women's socio-demographic characteristics.

This study has some implications for future research. A few potentially relevant covariates have been omitted in the survey, and especially those on the newborn's health: these could be crucial at the individual level to explain other differences in satisfaction between women, and even between hospitals.

CONCLUSION

This thesis addressed two themes tied to childbearing in Italy, in order to deepen the comprehension of some of the contrasting results noted in the literature, and to complement them with new findings for Italy. Finally, it focused on some features that have not been investigated yet, aiming to generate new knowledge on two issues about having children in Italy.

Beginning in the Seventies, the decrease in fertility in Italy has been sudden and unexpected, leading to a rapid population ageing, with its economic, social and political consequences.

In this context, the purpose of this thesis was to investigate in particular two issues.

The first regards the association between union dissolution and fertility, under different research perspectives.

My results agree in large part with those found in the existing literature. The analyses confirmed the lack of association between some childbearing characteristics and the stability of the couple, such as the children's gender or the timing of childbearing relative to premarital cohabitation and marriage (see e.g. Andersson and Woldemicael 2001; Diekmann and Schmidheiny 2004; Wu and Musick 2008). Therefore, my analyses reinforce and confirm also for Italy the irrelevance of these aspects on the risk of union dissolution, regardless the type of relationship.

Nevertheless, other childbearing features, such as the number and the age of children, remain unclear, but a possible explanation emerges. According to these results, the number and the age of children seem to have a different impact on the solidity of the relationship depending on the type of union and the respondent's gender. These associations, however, may not be generalised, and may have a cultural and temporal explanation. The recent diffusion of other kinds of union – including cohabitations - and the increase of union dissolutions, even in presence of children, could justify the lack of a clear influence of the children's age on the risk of union disruption, whereas in the past this childbearing characteristic could act as binding agent. The ethical assumption that parents' separation could negatively influence a healthy psychological growth of children if they are too young may no longer be applicable to Italy.

These results provide some new insights, especially regarding the differences between the various types of union, the gender perspective, and the presence of adopted/foster and stepchildren.

The presence of biological children of the couple emerges as a binding agent on all types of union – direct marriage, marriage preceded by cohabitation, and cohabitation - and for both genders. The effect is usually stronger for men than for women, and for cohabitations than for marriages. Among marriages, the protective action of children is higher for marriages preceded by cohabitation than for direct marriages. This comparison about the strength of the presence of

children on union stability between the various types of union adds new knowledge on this issue, and gives new starting points in comprehending the different kind of union.

Finally, the presence of adopted/foster or stepchildren within the couple is an aspect only rarely investigated in the literature, and, at best, only for marriages. In my analysis, no difference emerges between men and women, but there are striking dissimilarities between the various types of union. The presence of adopted/foster children, or stepchildren – of either partner - increases the risk of dissolution for direct marriages, both for men and for women, while it reduces the risk of disruption of cohabitations.

Thus, the comparison between different kinds of union adds new insights on the role of children in the stability of the union, showing how the action of children as binding factor for keeping partners' commitment seems to be more powerful in less resilient relationships, i.e., cohabitations.

This work does have implications for future research, which could not be undertaken here because of the lack of information in the data. First, it would be useful to be able to disentangle the effect of adopted, foster and stepchildren, so as to get more insights on the phenomenon. Even the timing of adopted/foster children's arrival compared to the formation of the relationship could influence the risk of union disruption, because a later arrival could promote union stability by giving the couple the time they need to develop strong interpersonal ties. Conversely, depending on how strongly the two partners want a child, a (perhaps too) long waiting time before birth could prove stressful. Secondly, the diffusion of new family formation practices and the higher risk of union dissolution are preparing the ground for a greater presence of stepchildren within romantic relationships, and of course, this issue needs to be dealt with properly in the near future. The presence of stepchildren could influence the couple stability and may be a source of discord and tension to a great extent if they live in the same household, compared to those who live outside.

Finally, some general reflections about the role of adopted and foster children in shaping union stability could be made. More specifically, the presence of adopted and foster children within families is the results of a usually very long process in Italy, where the intervention of the State is unavoidable. Despite this process (or because of this process, in some cases), the solidity of unions with adopted and foster children seems more fragile and more prone to disruption. This is in contrast with the very procedure for the adoption of a child, which aims at identifying a couple where the child could find a (new) life in peace and serenity. Given these results, the State should probably partly rethink the procedure of adoption, for example helping families after adoption or fostering in their difficult role in reshaping everyday life.

The part of my research looked at a specific regional context, Tuscany, and at a peculiar issue, women's satisfaction towards prenatal services, during recovery for delivery and towards postnatal services.

Previous studies on this topic are scarce and the link identified in the literature between women's satisfaction and their socio-demographic characteristics is not always straightforward. This work addressed the inconsistencies found in previous research, disentangling the association in the different phases of the process, and on different levels. Looking at the covariates already identified in the literature, such as the age, the birth order and the educational level, it added new insights focusing also on woman's citizenship.

Results confirm the importance of socio-demographic factors in explaining women's satisfaction, and their dependence on the phase of the birth path. Trying to combine these results with previous studies, the general conclusion emerges that the birth order is not significantly associated with the woman's satisfaction. The woman's age emerges as the only variable that is significant during pregnancy, but not at delivery and during postpartum: even in this case, this discrepancy could justify the contrasting results found in the literature. The woman's citizenship and her educational level seem to be the only variables that play a crucial role in their satisfaction. Nevertheless, the contrasting results found for the postnatal model compared to pregnancy and childbirth require some in-depth analyses and need to be addressed more specifically, because they could reveal a critical situation of counselling services during postpartum. Or it could partly explain the lack of influence found in some previous studies, which did not disentangle the different phases of the process.

This study has some implications for future research too. A few potentially relevant covariates, especially those on the new-born's health, could be crucial at the individual level to explain other differences in satisfaction between women, and even between hospitals.

Finally, some recommendations for decision-makers and health-care providers emerge, given the clinical relevance that women's satisfaction has with its positive implications on the health and well-being of the mother and the child. Both the influence of age on the women's satisfaction, as well as the effect of citizenship and education on it should be addressed by health authorities, because the quality of maternity services appears to be differently perceived according to women's socio-demographic characteristics. Even more, policy makers should address the discrepancy in women's satisfaction for equity reasons, stated that the National Health Services has among its fundamental principles the equity of the offered services.

APPENDIX A1 METHODOLOGICAL NOTES

A1.1 Missing variables

Missing variables among the dataset were really few, thanks to the high quality of data released by ISTAT. Given that nearly all variables with missing values were duration variables, the imputation method necessarily needed to take into account the other non-missing durations for each respondent. For this reason, the imputation for duration variables were on the basis of mean duration, but some corrections were necessary to avoid any incongruence in individuals' life course.

Table A1.1 – Missing variables: absolute and percentage values, imputation method.

Missing variables	Abs. values	% of total	Imputation method
Children's date of birth	13	0.05	Mean spell among births according to individual
Children's gender	150	0.54	Imputation through a Uniform discrete random variable
Union's entry	50	0.27	Mean duration of unions according to union order, gender, cohort, union type, and following union entry or not
Union's exit	19	0.10	Mean duration of unions according to union order, gender, cohort, union type, and following union entry or not
Job's entry	4	0.01	Mean duration of jobs according to gender, cohort, macroarea, and following job entry or not
Job's exit	409	1.12	Mean duration of jobs according to gender, cohort, macroarea, and following job entry or not

A1.2 Variable construction

Some variables have been prepared ad hoc for the analyses, and need some clarifications. A list of these covariates is reported.

Men's children: children born within the ongoing marriage were reported only for the female spouse in the questionnaire. For the husband, they have been attributed on the basis of the couple relationship.

Cohabitation dissolution: in FSS 2009, the ending date of cohabitation was reported, but it lacked the cause of dissolution, for separation or for death of the respondent's partner. Given that the hazard rate of death depends primarily on age and gender, the type of dissolution (for separation or for widowhood) was imputed estimating if the cohabiting partner was dead or not, through a model based regression imputation. For this reason, the first check was to verify if there was a significant age difference between cohabiting partners and spouses that the imputation should have

taken into account. Nonetheless, the analysis showed any significant age difference between cohabiting partners and spouses. At this point, the hypothesis that the hazard rate of death of cohabiting partners was the same of the spouses, once taken into account age and gender, could be justified. In the model based regression imputation, the link function of the model was the logistic one: the response variable accounted for the death or not of the respondent's partner, and the explanatory variables were the respondent's gender, and the respondent's age at the time of union disruption. Through this imputation, 198 cohabitations out of 2,146 (9.2% of total cohabitations) were imputed to be dissolved by the partner's death, and the remaining 1,948 by separation.

Educational attainment: in the analyses, the explanatory variable regarding the education was time-constant, and accounted for the highest educational level of the subject. The choice of avoiding a time-varying specification was made for the sake of simplicity, because only a negligible proportion of people did not complete their education before birth of the first child (5.2%), and even less before the disruption of the first union (1.4%). Then, the three educational levels varied according to the four cohorts, in such a way to take into account the increasing education of the youngest, and used the medium educational level as a reference point for all. As for the two older cohorts, a low educational level comprised only who completed (or not) the primary school; medium educated people were those who completed junior high school, or had a professional vocational qualification; and finally, high education comprised those who completed at least high school. As for the two youngest cohorts, the lowest level corresponded to junior high school or lower educational level; medium educated people were those who had a professional vocational qualification or completed high school, and high education was tertiary education.

Parents' educational level: the covariate regarding parents' high educational level for the subject was constructed considering if one or both parents had at least completed secondary school.

Number of children of previous relationships: those children accounted for: 1) children born within another couple relationships; 2) children born when the respondent did not live a union. In this latter case, children could be natural children of both partners of the following union, even if they were born outside union. Nevertheless, no information was available about it, and the most reasonable hypothesis was that this condition was negligible and very rare.

APPENDIX A2 TABLES

Table A2.1 – Explanatory time-constant variables. Percentage frequency. Women and Men.

Explanatory variables	Women	Men
Cohort		
1948-1958	33.94	30.94
1959-1968	36.17	33.63
1969-1978	25.12	26.81
1979-1993	4.77	8.61
Ever had adopted/foster children and/or stepchildren	0.88	0.55
Educational attainment		
low	19.76	22.76
medium	47.71	45.75
high	32.53	31.49
Parental divorce/separation	2.12	3.02
Parental high education	13.56	14.62
Macroarea of residence		
North	42.87	42.34
Centre	17.55	17.84
South	39.58	39.82

Table A2.2 – Direct marriage dissolution: exposures (person-year) and occurrences. Women and men. Absolute and percentage values.

	Women				Men			
	Exposure (person-year)		Direct marriage dissolution		Exposure (person-year)		Direct marriage dissolution	
Covariates	absolute value	%	absolute value	%	absolute value	%	absolute value	%
Time-varying covariates								
Calendar period								
Before 1980	10815	6.9	68	7.5	4319	3.6	24	3.4
1980-1989	31994	20.5	172	18.9	21820	18.3	123	17.6
1990-1999	50881	32.6	313	34.4	40089	33.6	234	33.6
2000-2009	62201	39.9	358	39.3	52932	44.4	316	45.3
Employment								
not working	85328	54.7	393	43.1	10201	8.6	95	13.6
working	70562	45.3	518	56.9	108960	91.4	602	86.4
Marriage order								
first marriage	155205	99.6	906	99.5	118384	99.3	691	99.1
second marriage	682	0.4	4	0.4	775	0.7	6	0.9
third marriage	3	0.0	1	0.1	2	0.0	0	0.0
Number of children had in previous unions								
0	150760	96.7	859	94.3	115111	96.6	651	93.4
1	4445	2.9	42	4.6	3510	2.9	35	5.0
2	481	0.3	8	0.9	395	0.3	9	1.3
3	192	0.1	2	0.2	132	0.1	1	0.1
4	12	0.0	0	0.0	13	0.0	1	0.1
Number of children of the couple								
0 children	25503	16.4	335	36.8	21365	17.9	307	44.0
1 child	49446	31.7	297	32.6	39090	32.8	202	29.0
2 or more children	80941	51.9	279	30.6	58705	49.3	188	27.0
Children's gender composition								
no children	25503	16.4	335	36.8	21365	17.9	307	44.0
both sexes	45930	29.5	152	16.7	33183	27.8	106	15.2

all females	43838	28.1	207	22.7	33260	27.9	153	22.0
all males	40619	26.1	217	23.8	31353	26.3	131	18.8
Time-constant covariates								
Cohort								
1948-1958	81366	52.2	287	31.5	67651	56.8	269	38.6
1959-1968	53920	34.6	366	40.2	40283	33.8	291	41.8
1969-1978	18559	11.9	214	23.5	10636	8.9	122	17.5
1979-1993	2046	1.3	44	4.8	591	0.5	15	2.2
Ever had adopted/foster children and/or stepchildren								
no	155448	99.7	899	98.7	118824	99.7	672	96.4
yes	442	0.3	12	1.3	337	0.3	25	3.6
Educational attainment								
low	37350	24.0	165	18.1	20318	17.1	118	16.9
medium	71768	46.0	402	44.1	57815	48.5	310	44.5
high	46773	30.0	344	37.8	41028	34.4	269	38.6
Parental divorce/separation								
no	153613	98.5	868	95.3	117539	98.6	677	97.1
yes	2278	1.5	43	4.7	1622	1.4	20	2.9
Parental high education								
no	142779	91.6	734	80.6	109596	92.0	580	83.2
yes	13111	8.4	177	19.4	9564	8.0	117	16.8
Macroarea of residence								
North	60796	39.0	433	47.5	46905	39.4	321	46.1
Centre	26775	17.2	205	22.5	20280	17.0	145	20.8
South	68320	43.8	273	30.0	51976	43.6	231	33.1

Table A2.3 – Indirect marriage dissolution: exposures (person-year) and occurrences. Women and men. Absolute and percentage values.

	Women				Men			
	Exposure (person-year)		Indirect marriage dissolution		Exposure (person-year)		Indirect marriage dissolution	
Covariates	absolute value	%	absolute value	%	absolute value	%	absolute value	%
Time-varying covariates								
Calendar period								
Before 1980	285	2.2	1	0.8	214	1.9	3	2.5
1980-1989	1524	11.9	17	13.0	1181	10.4	12	9.8
1990-1999	3704	28.9	36	27.5	3259	28.6	45	36.9
2000-2009	7317	57.0	77	58.8	6752	59.2	62	50.8
Employment								
not working	5290	41.2	39	29.8	1040	9.1	19	15.6
working	7539	58.8	92	70.2	10366	90.9	103	84.4
Children had during premarital cohabitation (yes/no)								
no children	2279	17.8	61	46.6	2154	18.9	60	49.2
not during cohabitation	6856	53.4	50	38.2	6308	55.3	44	36.1
yes during cohabitation	3694	28.8	20	15.3	2944	25.8	18	14.8
Number of years spent in premarital cohabitation								
0-2	5346	41.7	68	51.9	4636	40.6	52	42.6
2-4	2892	22.5	35	26.7	3309	29.0	48	39.3
4+	4591	35.8	28	21.4	3460	30.3	22	18.0
Marriage order								
first marriage	12619	98.4	128	97.7	11170	97.9	117	95.9
second marriage	201	1.6	3	2.3	236	2.1	5	4.1
third marriage	10	0.1	0	0.0	0	0.0	0.0	0.0
Number of children had in previous unions								
0	11449	89.2	112	85.5	9930	87.1	115	94.3
1	1054	8.2	13	9.9	1091	9.6	6	4.9
2	257	2.0	3	2.3	268	2.3	1	0.8
3	36	0.3	2	1.5	40	0.4	0	0.0

4	34	0.3	1	0.8	78	0.7	0	0.0
Number of children of the couple								
0 children	4896	38.2	61	46.6	4652	40.8	60	49.2
1 child	4126	32.2	38	29.0	3488	30.6	34	27.9
2 or more children	3808	29.7	32	24.4	3266	28.6	28	23.0
Children's gender composition								
no children	4896	38.2	61	46.6	4652	40.8	60	49.2
both sexes	2189	17.1	11	8.4	1943	17.0	16	13.1
all females	3056	23.8	26	19.8	2493	21.9	33	27.0
all males	2689	21.0	33	25.2	2317	20.3	13	10.7
Time-constant covariates								
Cohort								
1948-1958	3547	27.6	31	23.7	3850	33.8	42	34.4
1959-1968	4614	36.0	41	31.3	4559	40.0	51	41.8
1969-1978	3820	29.8	49	37.4	2625	23.0	25	20.5
1979-1993	849	6.6	10	7.6	372	3.3	4	3.3
Ever had adopted/foster children and/or stepchildren								
no	12611	98.3	128	97.7	11347	99.5	115	94.3
yes	219	1.7	3	2.3	59	0.5	7	5.7
Educational attainment								
low	2760	21.5	29	22.1	2193	19.2	20	16.4
medium	5352	41.7	57	43.5	5114	44.8	50	41.0
high	4718	36.8	45	34.4	4099	35.9	52	42.6
Parental divorce/separation								
no	12042	93.9	114	87.0	11051	96.9	119	97.5
yes	788	6.1	17	13.0	355	3.1	3	2.5
Parental high education								
no	10234	79.8	93	71.0	8909	78.1	90	73.8
yes	2596	20.2	38	29.0	2496	21.9	32	26.2
Macroarea of residence								
North	7270	56.7	72	55.0	6714	58.9	76	62.3
Centre	2572	20.0	40	30.5	2168	19.0	17	13.9
South	2988	23.3	19	14.5	2524	22.1	29	23.8

Table A2.4 – Cohabitation dissolution: exposures (person-year) and occurrences. Women and men. Absolute and percentage values.

	Women				Men			
	Exposure (person-year)		Cohabitation dissolution		Exposure (person-year)		Cohabitation dissolution	
Covariates	absolute value	%	absolute value	%	absolute value	%	absolute value	%
Time-varying covariates								
Calendar period								
Before 1980	72	1.3	5	1.6	89	1.7	19	3.4
1980-1989	453	8.3	39	12.2	392	7.3	79	14.2
1990-1999	1225	22.5	102	31.9	1215	22.6	142	25.4
2000-2009	3682	67.8	174	54.4	3681	68.5	318	57.0
Employment								
not working	1909	35.1	113	35.3	715	13.3	128	22.9
working	3523	64.9	207	64.7	4661	86.7	430	77.1
Cohabitation order								
first cohabitation	4979	91.7	280	87.5	4700	87.4	462	82.8
second cohabitation	406	7.5	38	11.9	548	10.2	76	13.6
third cohabitation	34	0.6	2	0.6	111	2.1	20	3.6
fourth cohabitation	13	0.2	0	0.0	17	0.3	0	0.0
Number of children had in previous unions								
0	4107	75.6	295	92.2	4177	77.7	511	91.6
1	892	16.4	19	5.9	768	14.3	35	6.3
2	274	5.0	4	1.3	263	4.9	9	1.6
3	129	2.4	2	0.6	137	2.5	2	0.4
4	30	0.5	0	0.0	22	0.4	1	0.2
5	0	0.0	0.0	0.0	10	0.2	0	0.0
6	1	0.0	0.0	0.0	0	0.0	0.0	0.0
Number of children of the couple								
0 children	3630	66.8	264	82.5	3949	73.5	519	93.0
1 child	1290	23.8	45	14.1	1021	19.0	29	5.2
2 or more children	512	9.4	11	3.4	406	7.5	10	1.8

Children's gender composition								
no children	3630	66.8	264	82.5	3949	73.5	519	93.0
both sexes	315	5.8	7	2.2	216	4.0	4	0.7
all females	753	13.9	27	8.4	605	11.3	18	3.2
all males	734	13.5	22	6.9	606	11.3	17	3.0
Time-constant covariates								
Cohort								
1948-1958	1137	20.9	37	11.6	1495	27.8	94	16.8
1959-1968	1746	32.1	88	27.5	1761	32.8	162	29.0
1969-1978	1907	35.1	134	41.9	1725	32.1	227	40.7
1979-1993	642	11.8	61	19.1	395	7.3	75	13.4
Ever had adopted/foster children and/or stepchildren								
no	5305	97.7	318	99.4	4926	91.6	548	98.2
yes	127	2.3	2	0.6	450	8.4	10	1.8
Educational attainment								
low	1355	24.9	67	20.9	1310	24.4	110	19.7
medium	2544	46.8	148	46.3	2523	46.9	260	46.6
high	1533	28.2	105	32.8	1543	28.7	188	33.7
Parental divorce/separation								
no	5040	92.8	274	85.6	5131	95.4	528	94.6
yes	392	7.2	46	14.4	245	4.6	30	5.4
Parental high education								
no	4337	79.8	216	67.5	4286	79.7	372	66.7
yes	1095	20.2	104	32.5	1090	20.3	186	33.3
Macroarea of residence								
North	3285	60.5	208	65.0	3324	61.8	335	60.0
Centre	1055	19.4	58	18.1	1042	19.4	112	20.1
South	1093	20.1	54	16.9	1010	18.8	111	19.9

Table A2.5 – Union dissolution: exposures (person-year) and occurrences. Women and men. Absolute and percentage values.

	Women				Men			
	Exposure (person-months)		Birth occurrence		Exposure (person-months)		Birth occurrence	
Covariates	absolute value	%	absolute value	%	absolute value	%	absolute value	%
Time-varying covariates								
Age								
15-23	894219	28.9	3120	20.6	763709	25.7	644	5.2
23-28	548563	17.7	4809	31.8	473894	16.0	2845	22.9
28-35	703713	22.7	5523	36.5	626008	21.1	5677	45.7
35+	951176	30.7	1687	11.1	1104575	37.2	3267	26.3
Employment								
not working	1741666	56.2	8866	58.6	733273	24.7	1287	10.4
working	1356005	43.8	6273	41.4	2234913	75.3	11146	89.6
Indicator whether union dissolution occurred within 3 years								
no	3089989	99.8	15048	99.4	2958260	99.7	12358	99.4
yes	7682	0.2	91	0.6	9926	0.3	75	0.6
Type of union								
no union (single)	1214407	39.2	636	4.2	1336957	45.0	523	4.2
cohabitation	101120	3.3	683	4.5	99694	3.4	557	4.5
indirect marriage	105084	3.4	905	6.0	101672	3.4	850	6.8
direct marriage	1677060	54.1	12915	85.3	1429863	48.2	10503	84.5
Union order								
not in union	1214407	39.2	636	4.2	1336957	45.0	523	4.2
first union	1831719	59.1	14180	93.7	1563857	52.7	11477	92.3
second union	48288	1.6	304	2.0	58768	2.0	385	3.1
third union	2879	0.1	18	0.1	6629	0.2	40	0.3
fourth union	341	0.0	1	0.0	1953	0.1	7	0.1
fifth union	37	0.0	0	0.0	22	0.0	1	0.0
Number of children had in previous unions								
0	3016696	97.4	14739	97.4	2887495	97.3	12061	97.0

1	67443	2.2	349	2.3	64411	2.2	310	2.5
2	9666	0.3	37	0.2	11107	0.4	42	0.3
3	3228	0.1	11	0.1	3716	0.1	11	0.1
4	630	0.0	3	0.0	1339	0.0	8	0.1
5	0	0.0	0	0.0	118	0.0	1	0.0
6	8	0.0	0	0.0	0	0.0	0	0.0
Number of children of the subject								
0	1304396	42.1	0	0.0	1462890	49.3	0	0.0
1	671734	21.7	7905	52.2	551086	18.6	6529	52.5
2	828394	26.7	5378	35.5	712706	24.0	4428	35.6
3	237318	7.7	1457	9.6	195990	6.6	1157	9.3
4	42190	1.4	291	1.9	35483	1.2	232	1.9
5	9516	0.3	70	0.5	6828	0.2	49	0.4
6	2774	0.1	25	0.2	2299	0.1	23	0.2
7	857	0.0	8	0.1	598	0.0	7	0.1
8	467	0.0	4	0.0	227	0.0	5	0.0
9	25	0.0	1	0.0	79	0.0	3	0.0
Time-constant covariates								
Cohort								
1948-1958	1177488	38.0	5415	35.8	1325942	44.7	5020	40.4
1959-1968	1157432	37.4	5477	36.2	1067289	36.0	4759	38.3
1969-1978	641967	20.7	3569	23.6	515144	17.4	2416	19.4
1979-1993	120784	3.9	678	4.5	59811	2.0	238	1.9
Ever had adopted/foster children and/or stepchildren								
no	3080547	99.4	15127	99.9	2942964	99.2	12402	99.8
yes	17124	0.6	12	0.1	25222	0.8	31	0.2
Educational attainment								
low	656241	21.2	3836	25.3	519738	17.5	2487	20.0
medium	1401158	45.2	6857	45.3	1399334	47.1	5921	47.6
high	1040272	33.6	4446	29.4	1049114	35.3	4025	32.4
Parental divorce/separation								
no	3018496	97.4	14757	97.5	2914208	98.2	12188	98.0
yes	79175	2.6	382	2.5	53978	1.8	245	2.0

Parental high education (yes/no)								
no	2695307	87.0	13401	88.5	2610745	88.0	11107	89.3
yes	402364	13.0	1738	11.5	357441	12.0	1326	10.7
Macroarea of residence								
North	1305341	42.1	5748	38.0	1262717	42.5	4807	38.7
Centre	553213	17.9	2523	16.7	520640	17.5	2058	16.6
South	1239117	40.0	6868	45.4	1184829	39.9	5568	44.8

Table A2.6 – Fertility: exposures (person-year) and birth occurrences. Women and men. Absolute and percentage values.

	Women				Men			
	Exposure (person-year)		Birth occurrence		Exposure (person-year)		Birth occurrence	
Covariates	absolute value	%	absolute value	%	absolute value	%	absolute value	%
Time-varying covariates								
Age								
15-23	74518	28.9	3120	20.6	63642	25.7	644	5.2
23-28	45714	17.7	4809	31.8	39491	16.0	2845	22.9
28-35	58643	22.7	5523	36.5	52167	21.1	5677	45.7
35+	79265	30.7	1687	11.1	92048	37.2	3267	26.3
Employment								
not working	145139	56.2	8866	58.6	61106	24.7	1287	10.4
working	113000	43.8	6273	41.4	186243	75.3	11146	89.6
Type of union								
no union (single)	101201	39.2	636	4.2	111413	45.0	523	4.2
cohabitation	8427	3.3	683	4.5	8308	3.4	557	4.5
indirect marriage	8757	3.4	905	6.0	8473	3.4	850	6.8
direct marriage	139755	54.1	12915	85.3	119155	48.2	10503	84.5
Number of children had in previous unions								
0	251391	97.4	14739	97.4	240625	97.3	12061	97.0
1	5620	2.2	349	2.3	5368	2.2	310	2.5
2	806	0.3	37	0.2	926	0.4	42	0.3
3	269	0.1	11	0.1	310	0.1	11	0.1
4	53	0.0	3	0.0	112	0.0	8	0.1
5	0	0.0	0	0.0	10	0.0	1	0.0
6	1	0.0	0	0.0	0	0.0	0	0.0
Number of children of the subject								
0	108700	42.1	0	0.0	121908	49.3	0	0.0
1	55978	21.7	7905	52.2	45924	18.6	6529	52.5
2	69033	26.7	5378	35.5	59392	24.0	4428	35.6

3	19777	7.7	1457	9.6	16333	6.6	1157	9.3
4	3516	1.4	291	1.9	2957	1.2	232	1.9
5	793	0.3	70	0.5	569	0.2	49	0.4
6	231	0.1	25	0.2	192	0.1	23	0.2
7	71	0.0	8	0.1	50	0.0	7	0.1
8	39	0.0	4	0.0	19	0.0	5	0.0
9	2	0.0	1	0.0	7	0.0	3	0.0
Time-constant covariates								
Cohort								
1948-1958	98124	38.0	5415	35.8	110495	44.7	5020	40.4
1959-1968	96453	37.4	5477	36.2	88941	36.0	4759	38.3
1969-1978	53497	20.7	3569	23.6	42929	17.4	2416	19.4
1979-1993	10065	3.9	678	4.5	4984	2.0	238	1.9
Educational attainment								
low	54687	21.2	3836	25.3	43312	17.5	2487	20.0
medium	116763	45.2	6857	45.3	116611	47.1	5921	47.6
high	86689	33.6	4446	29.4	87426	35.3	4025	32.4
Parental divorce/separation								
no	251541	97.4	14757	97.5	242851	98.2	12188	98.0
yes	6598	2.6	382	2.5	4498	1.8	245	2.0
Macroarea of residence								
North	108778	42.1	5748	38.0	105226	42.5	4807	38.7
Centre	46101	17.9	2523	16.7	43387	17.5	2058	16.6
South	103260	40.0	6868	45.4	98736	39.9	5568	44.8

Table A2.7 – Coefficient estimates and standard errors of the four-equation specification. Women; Model 0-2.

	Model 0			Model 1			Model 2		
	Coeff.		Std. error	Coeff.		Std. error	Coeff.		Std. error
Fertility									
Intercept	-5.998	***	0.078	-5.996	***	0.078	-6.160	***	0.081
Duration since previous childbirth									
0-3 years (slope)	1.060	***	0.024	1.060	***	0.025	1.066	***	0.025
3-5 years (slope)	0.368	***	0.016	0.368	***	0.016	0.390	***	0.017
>5 years (slope)	0.085	***	0.003	0.085	***	0.003	0.095	***	0.003
Duration since union formation									
0-2 years (slope)	0.375	***	0.023	0.375	***	0.023	0.390	***	0.024
2-4 years (slope)	-0.295	***	0.016	-0.295	***	0.017	-0.295	***	0.017
>4 years (slope)	-0.347	***	0.003	-0.347	***	0.003	-0.355	***	0.004
Cohort (ref. 1948-1958)									
1959-1968	0.064	***	0.020	0.064	***	0.020	0.064	***	0.023
1969-1978	0.189	***	0.021	0.189	***	0.021	0.207	***	0.025
1979-1993	0.237	***	0.049	0.237	***	0.049	0.247	***	0.053
Macroarea of residence (ref. North)									
Centre	-0.009		0.023	-0.009		0.023	0.002		0.028
South	0.004		0.020	0.004		0.021	-0.005		0.023
Education (ref. Low)									
Medium education	0.031		0.020	0.031		0.020	0.042	*	0.023
High education	0.128	***	0.028	0.128	***	0.028	0.145	***	0.031
Age (ref. 15-22 years)									
23-27 years	-0.783	***	0.026	-0.783	***	0.027	-0.850	***	0.030
28-34 years	-1.171	***	0.030	-1.171	***	0.031	-1.281	***	0.036
35 years or more	-1.880	***	0.044	-1.880	***	0.044	-2.032	***	0.050
Number of children	1.264	***	0.006	1.263	***	0.006	1.357	***	0.012
Type of union (ref. Direct marriage)									
Cohabitation	-0.533	***	0.045	-0.533	***	0.046	-0.508	***	0.048
Marriage subsequent cohabitation	-0.419	***	0.023	-0.419	***	0.024	-0.398	***	0.028
Not in union (single)	-3.539	***	0.045	-3.540	***	0.045	-3.512	***	0.048
Number of children had in previous unions	-1.129	***	0.042	-1.128	***	0.043	-1.218	***	0.047
Employment (ref. Not working)									

Working	-0.101	***	0.021	-0.101	***	0.021	-0.115	***	0.022
Dissolution of direct marriage									
Intercept	-3.978	***	0.360	-3.938	***	0.362	-3.952	***	0.362
Duration of marriage									
0-3 years (slope)	-0.283	***	0.052	-0.283	***	0.053	-0.276	***	0.053
3-7 years (slope)	0.116	***	0.043	0.116	***	0.043	0.120	***	0.043
7-10 years (slope)	0.014		0.051	0.015		0.052	0.018		0.052
>10 years (slope)	-0.011		0.015	-0.011		0.015	-0.011		0.015
Duration since childbirth									
0-6 years (slope)	-0.059	**	0.030	-0.059	*	0.030	-0.060	**	0.030
6-10 years (slope)	0.021		0.045	0.021		0.045	0.023		0.045
>10 years (slope)	-0.025		0.020	-0.025		0.020	-0.024		0.020
Cohort (ref. 1948-1958)									
1959-1968	0.555	***	0.108	0.553	***	0.108	0.568	***	0.108
1969-1978	1.086	***	0.160	1.083	***	0.161	1.107	***	0.161
1979-1993	1.597	***	0.233	1.595	***	0.234	1.627	***	0.235
Calendar period (ref. Before 1980)									
1980-1989	-0.274	*	0.155	-0.272	*	0.157	-0.286	*	0.157
1990-1999	-0.309	*	0.176	-0.306	*	0.178	-0.328	*	0.179
2000-2009	-0.524	**	0.205	-0.521	**	0.208	-0.549	***	0.208
Ever had adopted/foster children and/or stepchildren (ref. No)									
Yes	1.453	***	0.291	1.454	***	0.297	1.493	***	0.299
Macroarea of residence (ref. North)									
Centre	0.114		0.086	0.113		0.087	0.113		0.087
South	-0.434	***	0.082	-0.433	***	0.082	-0.436	***	0.083
Parental education (ref. Low-Medium)									
High education	0.532	***	0.091	0.533	***	0.091	0.536	***	0.092
Education (ref. Low)									
Medium education	0.092		0.100	0.090		0.100	0.088		0.101
High education	0.329	***	0.116	0.325	***	0.116	0.330	***	0.117
Parental separation/divorce (ref. No)									
Yes	0.788	***	0.162	0.788	***	0.163	0.790	***	0.165
Marriage order	-0.550	*	0.318	-0.588	*	0.320	-0.591	*	0.320
Number of children had in previous unions	0.388	***	0.114	0.390	***	0.117	0.356	***	0.117
Number of children of the couple (ref. 0 children)									
1 child	-0.174		0.132	-0.175		0.133	-0.196		0.133

2 or more children	-0.457	***	0.148	-0.457	***	0.149	-0.494	***	0.150
Child sex composition (ref. All females)									
Both sexes	-0.084		0.132	-0.084		0.133	-0.080		0.133
All males	-0.100		0.098	-0.100		0.098	-0.101		0.098
Employment (ref. Not working)									
Working	0.203	***	0.072	0.203	***	0.072	0.198	***	0.072
Dissolution of marriage with premarital cohabitation									
Intercept	-7.294	***	1.342	-7.326	***	1.346	-7.312	***	1.355
Duration of cohabitation and subsequent marriage									
0-3 years (slope)	0.837	***	0.280	0.830	***	0.282	0.836	***	0.282
3-7 years (slope)	-0.015		0.105	-0.013		0.106	-0.009		0.107
7-10 years (slope)	-0.115		0.140	-0.115		0.141	-0.111		0.142
>10 years (slope)	0.050		0.040	0.050		0.042	0.053		0.042
Duration since childbirth									
0-6 years (slope)	0.136		0.094	0.136		0.096	0.136		0.096
6-10 years (slope)	-0.048		0.132	-0.048		0.138	-0.049		0.137
>10 years (slope)	-0.012		0.050	-0.012		0.051	-0.013		0.051
Cohort (ref. 1948-1958)									
1959-1968	0.182		0.277	0.184		0.281	0.194		0.283
1969-1978	0.747	**	0.358	0.749	**	0.361	0.772	**	0.363
1979-1993	0.871	*	0.528	0.876	*	0.531	0.911	*	0.533
Calendar period (ref. Before 1980)									
1980-1989	0.653		1.191	0.677		1.195	0.652		1.196
1990-1999	0.170		1.186	0.191		1.192	0.152		1.193
2000-2009	-0.174		1.225	-0.153		1.231	-0.204		1.233
Ever had adopted/foster children and/or stepchildren (ref. No)									
Yes	0.288		0.517	0.313		0.525	0.359		0.530
Macroarea of residence (ref. North)									
Centre	0.450	**	0.210	0.449	**	0.211	0.450	**	0.213
South	-0.214		0.312	-0.219		0.318	-0.214		0.318
Parental education (ref. Low-Medium)									
High education	0.385		0.242	0.384		0.244	0.380		0.245
Education (ref. Low)									
Medium education	-0.112		0.265	-0.113		0.269	-0.114		0.270
High education	-0.247		0.336	-0.249		0.339	-0.246		0.340
Parental separation/divorce (ref. No)									

Yes	0.743	***	0.286	0.741	**	0.292	0.752	**	0.293
Marriage order	0.106		0.835	0.134		0.840	0.103		0.856
Number of children had in previous unions	0.457	**	0.180	0.455	**	0.183	0.445	**	0.189
Number of children of the couple (ref. 0 children)									
1 child	-0.785	**	0.377	-0.789	**	0.378	-0.815	**	0.379
2 or more children	-0.370		0.430	-0.372		0.435	-0.406		0.436
Children had during premarital cohabitation (ref. No)									
Yes	-0.366		0.000	-0.366		0.000	-0.366		0.000
Number of years spent in premarital cohabitation (ref. 0-2 years)									
2-4 years	-0.101		0.235	-0.098		0.236	-0.086		0.237
+4 years	-0.878	***	0.284	-0.880	***	0.287	-0.856	***	0.288
Child sex composition (ref. All females)									
Both sexes	-1.088	**	0.429	-1.097	**	0.435	-1.091	**	0.435
All males	-0.329		0.286	-0.333		0.287	-0.341		0.289
Employment (ref. Not working)									
Working	0.485	**	0.225	0.488	**	0.227	0.480	**	0.227
Dissolution of cohabitation									
Intercept	-3.373	***	0.513	-3.373	***	0.514	-3.410	***	0.517
Duration of cohabitation									
0-3 years (slope)	0.120		0.073	0.120		0.074	0.130	*	0.074
3-7 years (slope)	-0.048		0.068	-0.048		0.069	-0.043		0.069
7-10 years (slope)	-0.209		0.144	-0.207		0.145	-0.205		0.145
>10 years (slope)	0.017		0.099	0.014		0.101	0.015		0.102
Duration since childbirth									
0-6 years (slope)	0.230	**	0.089	0.230	**	0.090	0.229	**	0.090
6-10 years (slope)	-0.200		0.236	-0.196		0.237	-0.195		0.238
>10 years (slope)	0.066		0.130	0.068		0.132	0.068		0.132
Cohort (ref. 1948-1958)									
1959-1968	0.561	**	0.236	0.563	**	0.239	0.563	**	0.245
1969-1978	1.204	***	0.288	1.206	***	0.291	1.198	***	0.296
1979-1993	1.632	***	0.324	1.635	***	0.328	1.634	***	0.333
Calendar period (ref. Before 1980)									
1980-1989	-0.223		0.493	-0.227		0.495	-0.219		0.497
1990-1999	-0.556		0.501	-0.558		0.504	-0.546		0.506
2000-2009	-1.434	***	0.522	-1.437	***	0.525	-1.424	***	0.528
Ever had adopted/foster children and/or stepchildren (ref. No)									

Yes	-1.175	*	0.706	-1.177	*	0.710	-1.159		0.712
Macroarea of residence (ref. North)									
Centre	-0.051		0.154	-0.051		0.155	-0.055		0.157
South	0.024		0.181	0.025		0.182	0.017		0.185
Parental education (ref. Low-Medium)									
High education	0.355	**	0.140	0.355	**	0.140	0.362	**	0.143
Education (ref. Low)									
Medium education	0.232		0.163	0.233		0.164	0.233		0.166
High education	0.497	**	0.195	0.498	**	0.196	0.502	**	0.198
Parental separation/divorce (ref. No)									
Yes	0.457	**	0.181	0.458	**	0.182	0.471	**	0.186
Cohabitation order	0.441	***	0.148	0.440	***	0.148	0.439	***	0.151
Number of children had in previous unions	-0.582	***	0.155	-0.580	***	0.159	-0.620	***	0.160
Number of children of the couple (ref. 0 children)									
1 child	-1.306	***	0.334	-1.305	***	0.335	-1.349	***	0.336
2 or more children	-1.714	***	0.571	-1.721	***	0.575	-1.784	***	0.578
Child sex composition (ref. All females)									
Both sexes	0.436		0.657	0.451		0.661	0.436		0.665
All males	0.195		0.305	0.194		0.306	0.207		0.308
Employment (ref. Not working)									
Working	-0.051		0.129	-0.050		0.130	-0.052		0.131
Heterogeneity term							0.212	***	0.014

Table A2.8 – Coefficient estimates and standard errors of the four-equation specification. Men; Model 0-3.

	Model 0			Model 1			Model 2			Model 3		
	Coeff.		Std. error	Coeff.		Std. error	Coeff.		Std. error	Coeff.		Std. error
Fertility												
Intercept	-6.119	***	0.102	-6.120	***	0.103	-6.236	***	0.106	-6.248	***	0.107
Duration since previous childbirth												
0-3 years (slope)	1.027	***	0.029	1.027	***	0.029	1.026	***	0.030	1.026	***	0.030
3-5 years (slope)	0.448	***	0.019	0.448	***	0.019	0.470	***	0.020	0.471	***	0.020
>5 years (slope)	0.069	***	0.002	0.069	***	0.002	0.077	***	0.003	0.078	***	0.003
Duration since union formation												
0-2 years (slope)	0.404	***	0.027	0.404	***	0.027	0.418	***	0.027	0.419	***	0.027
2-4 years (slope)	-0.256	***	0.016	-0.256	***	0.017	-0.248	***	0.017	-0.248	***	0.017
>4 years (slope)	-0.385	***	0.003	-0.385	***	0.003	-0.392	***	0.004	-0.393	***	0.004
Cohort (ref. 1948-1958)												
1959-1968	0.087	***	0.021	0.087	***	0.021	0.090	***	0.024	0.089	***	0.024
1969-1978	0.189	***	0.028	0.189	***	0.029	0.202	***	0.032	0.200	***	0.032
1979-1993	0.195	**	0.080	0.195	**	0.081	0.201	**	0.083	0.197	**	0.084
Macroarea of residence (ref. North)												
Centre	0.026		0.023	0.026		0.023	0.026		0.027	0.028		0.027
South	0.118	***	0.020	0.118	***	0.021	0.111	***	0.023	0.111	***	0.023
Education (ref. Low)												
Medium education	-0.004		0.025	-0.004		0.026	0.003		0.029	0.003		0.029
High education	0.004		0.029	0.004		0.029	0.015		0.033	0.015		0.033
Age (ref. 15-22 years)												
23-27 years	-0.653	***	0.051	-0.652	***	0.052	-0.718	***	0.053	-0.724	***	0.053
28-34 years	-1.221	***	0.054	-1.221	***	0.055	-1.338	***	0.059	-1.348	***	0.059
35 years or more	-1.627	***	0.059	-1.627	***	0.059	-1.785	***	0.066	-1.797	***	0.067
Number of children	1.402	***	0.006	1.401	***	0.006	1.490	***	0.013	1.500	***	0.013
Type of union (ref. Direct marriage)												
Cohabitation	-0.705	***	0.048	-0.705	***	0.049	-0.688	***	0.051	-0.688	***	0.052
Marriage subsequent cohabitation	-0.376	***	0.030	-0.375	***	0.031	-0.370	***	0.035	-0.367	***	0.035
Not in union (single)	-3.492	***	0.049	-3.492	***	0.050	-3.471	***	0.052	-3.458	***	0.052
Number of children had in previous unions	-1.272	***	0.036	-1.271	***	0.038	-1.337	***	0.040	-1.337	***	0.041
Employment (ref. Not working)												

Working	-0.065	**	0.031	-0.065	**	0.031	-0.069	**	0.033	-0.068	**	0.033
Dissolution of direct marriage												
Intercept	-3.594	***	0.541	-3.596	***	0.552	-3.632	***	0.551	-3.597	***	0.552
Duration of marriage												
0-3 years (slope)	-0.158	***	0.060	-0.158	***	0.060	-0.152	**	0.060	-0.158	***	0.060
3-7 years (slope)	0.074		0.047	0.073		0.048	0.077		0.048	0.074		0.048
7-10 years (slope)	-0.074		0.060	-0.074		0.061	-0.072		0.061	-0.074		0.061
>10 years (slope)	0.006		0.015	0.006		0.015	0.007		0.015	0.006		0.015
Duration since childbirth												
0-6 years (slope)	0.020		0.037	0.020		0.037	0.018		0.037	0.020		0.037
6-10 years (slope)	0.042		0.050	0.042		0.051	0.042		0.051	0.042		0.051
>10 years (slope)	-0.085	***	0.025	-0.085	***	0.025	-0.085	***	0.025	-0.085	***	0.025
Cohort (ref. 1948-1958)												
1959-1968	0.362	***	0.108	0.361	***	0.109	0.368	***	0.109	0.360	***	0.109
1969-1978	0.597	***	0.174	0.596	***	0.176	0.604	***	0.176	0.595	***	0.176
1979-1993	1.000	***	0.319	1.000	***	0.320	1.013	***	0.321	1.000	***	0.321
Calendar period (ref. Before 1980)												
1980-1989	0.170		0.228	0.169		0.236	0.163		0.236	0.169		0.236
1990-1999	0.245		0.234	0.245		0.241	0.237		0.241	0.245		0.241
2000-2009	0.318		0.256	0.318		0.263	0.310		0.263	0.318		0.263
Ever had adopted/foster children and/or stepchildren (ref. No)												
Yes	2.352	***	0.237	2.362	***	0.238	2.413	***	0.255	2.362	***	0.238
Macroarea of residence (ref. North)												
Centre	0.082		0.104	0.082		0.105	0.082		0.105	0.082		0.105
South	-0.348	***	0.090	-0.349	***	0.090	-0.344	***	0.091	-0.349	***	0.091
Parental education (ref. Low-Medium)												
High education	0.552	***	0.110	0.549	***	0.110	0.560	***	0.111	0.549	***	0.111
Education (ref. Low)												
Medium education	-0.062		0.119	-0.062		0.120	-0.065		0.121	-0.063		0.120
High education	0.100		0.132	0.099		0.133	0.097		0.134	0.099		0.134
Parental separation/divorce (ref. No)												
Yes	0.474	**	0.233	0.474	**	0.235	0.475	**	0.236	0.474	**	0.235
Marriage order	-0.571		0.451	-0.567		0.459	-0.551		0.459	-0.565		0.460
Number of children had in previous unions	0.378	***	0.110	0.377	***	0.113	0.344	***	0.114	0.378	***	0.113
Number of children of the couple (ref. 0 children)												
1 child	-0.852	***	0.159	-0.852	***	0.161	-0.870	***	0.161	-0.852	***	0.161

2 or more children	-1.207	***	0.192	-1.209	***	0.196	-1.237	***	0.196	-1.208	***	0.197
Child sex composition (ref. All females)												
Both sexes	0.052		0.168	0.052		0.169	0.052		0.169	0.052		0.169
All males	0.093		0.123	0.094		0.123	0.091		0.124	0.094		0.124
Employment (ref. Not working)												
Working	-0.521	***	0.114	-0.519	***	0.114	-0.521	***	0.115	-0.519	***	0.115
Dissolution of marriage with premarital cohabitation												
Intercept	-5.718	***	1.059	-5.705	***	1.082	-5.729	***	1.071	-5.710	***	1.080
Duration of cohabitation and subsequent marriage												
0-3 years (slope)	0.441	*	0.242	0.440	*	0.244	0.445	*	0.245	0.440	*	0.244
3-7 years (slope)	0.080		0.106	0.081		0.106	0.086		0.107	0.082		0.106
7-10 years (slope)	0.224	*	0.128	0.224	*	0.129	0.226	*	0.129	0.223	*	0.129
>10 years (slope)	-0.038		0.052	-0.038		0.052	-0.038		0.052	-0.038		0.052
Duration since childbirth												
0-6 years (slope)	-0.114		0.106	-0.114		0.106	-0.114		0.106	-0.113		0.107
6-10 years (slope)	0.133		0.144	0.134		0.145	0.134		0.145	0.133		0.146
>10 years (slope)	0.047		0.072	0.047		0.074	0.048		0.074	0.047		0.074
Cohort (ref. 1948-1958)												
1959-1968	0.140		0.264	0.140		0.267	0.132		0.268	0.140		0.267
1969-1978	0.354		0.408	0.356		0.414	0.356		0.415	0.355		0.414
1979-1993	0.357		0.782	0.359		0.789	0.368		0.792	0.358		0.789
Calendar period (ref. Before 1980)												
1980-1989	-0.679		0.733	-0.679		0.743	-0.695		0.742	-0.678		0.743
1990-1999	-0.406		0.751	-0.403		0.761	-0.420		0.762	-0.403		0.761
2000-2009	-0.842		0.768	-0.839		0.780	-0.855		0.781	-0.838		0.780
Ever had adopted/foster children and/or stepchildren (ref. No)												
Yes	2.755	***	0.644	2.754	***	0.651	2.769	***	0.656	2.752	***	0.652
Macroarea of residence (ref. North)												
Centre	-0.265		0.302	-0.265		0.306	-0.261		0.307	-0.264		0.306
South	0.169		0.257	0.172		0.259	0.177		0.260	0.172		0.259
Parental education (ref. Low-Medium)												
High education	0.069		0.239	0.067		0.240	0.075		0.241	0.067		0.242
Education (ref. Low)												
Medium education	0.012		0.314	0.015		0.317	0.014		0.317	0.016		0.317
High education	0.277		0.369	0.281		0.371	0.274		0.372	0.280		0.371
Parental separation/divorce (ref. No)												

Yes	-0.249		0.664	-0.245		0.665	-0.254		0.666	-0.242		0.666
Marriage order	1.377		0.862	1.352		0.881	1.369		0.888	1.356		0.880
Number of children had in previous unions	-0.631		0.498	-0.627		0.511	-0.666		0.513	-0.632		0.510
Number of children of the couple (ref. 0 children)												
1 child	-0.878	**	0.419	-0.880	**	0.424	-0.901	**	0.425	-0.883	**	0.425
2 or more children	-1.419	***	0.495	-1.420	***	0.500	-1.454	***	0.501	-1.423	***	0.501
Children had during premarital cohabitation (ref. No)												
Yes	-0.204		0.000	-0.204		0.000	-0.204		0.000	-0.204		0.000
Number of years spent in premarital cohabitation (ref. 0-2 years)												
2-4 years	-0.043		0.233	-0.039		0.235	-0.031		0.237	-0.038		0.236
+4 years	-0.986	***	0.300	-0.980	***	0.303	-0.963	***	0.303	-0.978	***	0.302
Child sex composition (ref. All females)												
Both sexes	0.496		0.477	0.498		0.484	0.512		0.484	0.498		0.484
All males	0.742	**	0.363	0.742	**	0.366	0.738	**	0.367	0.741	**	0.367
Employment (ref. Not working)												
Working	-0.792	***	0.306	-0.791	**	0.309	-0.799	***	0.309	-0.791	**	0.309
Dissolution of cohabitation												
Intercept	-2.248	***	0.337	-2.249	***	0.344	-2.285	***	0.353	-2.248	***	0.344
Duration of cohabitation												
0-3 years (slope)	0.103	**	0.051	0.103	**	0.052	0.118	**	0.052	0.103	**	0.052
3-7 years (slope)	-0.121	**	0.055	-0.121	**	0.056	-0.116	**	0.056	-0.121	**	0.056
7-10 years (slope)	0.024		0.112	0.025		0.113	0.029		0.113	0.025		0.113
>10 years (slope)	-0.111	**	0.056	-0.112	**	0.056	-0.110	*	0.056	-0.112	**	0.057
Duration since childbirth												
0-6 years (slope)	-0.063		0.137	-0.062		0.138	-0.065		0.138	-0.062		0.138
6-10 years (slope)	0.194		0.369	0.189		0.370	0.191		0.370	0.189		0.370
>10 years (slope)	-0.069		0.409	-0.058		0.410	-0.058		0.410	-0.058		0.410
Cohort (ref. 1948-1958)												
1959-1968	0.487	***	0.146	0.486	***	0.148	0.484	***	0.151	0.485	***	0.148
1969-1978	1.097	***	0.176	1.096	***	0.178	1.099	***	0.181	1.096	***	0.178
1979-1993	1.446	***	0.213	1.446	***	0.215	1.455	***	0.218	1.445	***	0.215
Calendar period (ref. Before 1980)												
1980-1989	-0.227		0.308	-0.228		0.316	-0.221		0.324	-0.228		0.316
1990-1999	-0.913	***	0.322	-0.912	***	0.330	-0.911	***	0.338	-0.912	***	0.330
2000-2009	-1.310	***	0.325	-1.309	***	0.333	-1.315	***	0.341	-1.309	***	0.333
Ever had adopted/foster children and/or stepchildren (ref. No)												

Yes	-1.011	***	0.313	-1.009	***	0.317	-1.002	***	0.324	-1.009	***	0.317
Macroarea of residence (ref. North)												
Centre	0.142		0.107	0.142		0.108	0.145		0.110	0.142		0.108
South	0.182		0.118	0.182		0.118	0.192		0.122	0.182		0.118
Parental education (ref. Low-Medium)												
High education	0.168		0.102	0.169		0.103	0.176	*	0.106	0.169		0.103
Education (ref. Low)												
Medium education	0.342	***	0.122	0.342	***	0.123	0.353	***	0.125	0.342	***	0.123
High education	0.485	***	0.148	0.485	***	0.149	0.495	***	0.152	0.485	***	0.149
Parental separation/divorce (ref. No)												
Yes	-0.027		0.196	-0.028		0.197	-0.018		0.203	-0.027		0.197
Cohabitation order	0.329	***	0.090	0.329	***	0.091	0.336	***	0.093	0.329	***	0.091
Number of children had in previous unions	-0.385	***	0.100	-0.383	***	0.103	-0.418	***	0.104	-0.382	***	0.104
Number of children of the couple (ref. 0 children)												
1 child	-1.104	***	0.337	-1.102	***	0.340	-1.150	***	0.341	-1.102	***	0.340
2 or more children	-0.727		0.584	-0.734		0.588	-0.814		0.591	-0.734		0.588
Child sex composition (ref. All females)												
Both sexes	-0.603		0.699	-0.600		0.703	-0.582		0.705	-0.600		0.702
All males	0.019		0.348	0.013		0.353	0.024		0.354	0.013		0.353
Employment (ref. Not working)												
Working	-0.285	***	0.110	-0.285	**	0.111	-0.298	***	0.113	-0.285	**	0.111
Heterogeneity term							0.198	***	0.015			
Heterogeneity term for fertility										0.208	***	0.015
Heterogeneity term for union dissolution										1.1E-97		1.1E+15

Table A2.9 – Coefficient estimates and standard errors of the two-equation specification. Women; Model 0-2.

	Model 0			Model 1			Model 2		
	Coeff.		Std. error	Coeff.		Std. error	Coeff.		Std. error
Fertility									
Intercept	-5.998	***	0.078	-5.996	***	0.078	-6.160	***	0.081
Duration since previous childbirth									
0-3 years (slope)	1.060	***	0.024	1.060	***	0.025	1.066	***	0.025
3-5 years (slope)	0.368	***	0.016	0.368	***	0.016	0.391	***	0.017
>5 years (slope)	0.085	***	0.003	0.085	***	0.003	0.095	***	0.003
Duration since union formation									
0-2 years (slope)	0.375	***	0.023	0.375	***	0.023	0.391	***	0.024
2-4 years (slope)	-0.295	***	0.016	-0.295	***	0.016	-0.295	***	0.017
>4 years (slope)	-0.347	***	0.003	-0.347	***	0.003	-0.355	***	0.004
Cohort (ref. 1948-1958)									
1959-1968	0.064	***	0.020	0.064	***	0.020	0.064	***	0.023
1969-1978	0.189	***	0.021	0.189	***	0.021	0.207	***	0.025
1979-1993	0.237	***	0.049	0.237	***	0.049	0.247	***	0.053
Macroarea of residence (ref. North)									
Centre	-0.009		0.023	-0.009		0.023	0.002		0.028
South	0.004		0.020	0.004		0.020	-0.005		0.023
Education (ref. Low)									
Medium education	0.031		0.020	0.031		0.020	0.042	*	0.023
High education	0.128	***	0.028	0.128	***	0.028	0.145	***	0.031
Age (ref. 15-22 years)									
23-27 years	-0.783	***	0.026	-0.783	***	0.026	-0.851	***	0.030
28-34 years	-1.171	***	0.030	-1.171	***	0.031	-1.283	***	0.036
35 years or more	-1.880	***	0.044	-1.880	***	0.044	-2.035	***	0.050
Number of children	1.264	***	0.006	1.263	***	0.006	1.357	***	0.012
Type of union (ref. Direct marriage)									
Cohabitation	-0.533	***	0.045	-0.533	***	0.045	-0.512	***	0.047
Marriage subsequent cohabitation	-0.419	***	0.023	-0.419	***	0.023	-0.395	***	0.027
Not in union (single)	-3.539	***	0.045	-3.540	***	0.045	-3.513	***	0.048
Number of children of previous union	-1.129	***	0.042	-1.128	***	0.042	-1.220	***	0.046

Employment (ref. Not working)									
Working	-0.101	***	0.021	-0.101	***	0.021	-0.115	***	0.022
Dissolution of union									
Intercept	-3.939	***	0.206	-3.942	***	0.207	-3.946	***	0.207
Duration of union									
0-3 years (slope)	-0.066	*	0.040	-0.066	*	0.040	-0.059		0.040
3-7 years (slope)	0.049		0.034	0.049		0.034	0.053		0.034
7-10 years (slope)	-0.027		0.044	-0.027		0.044	-0.024		0.044
>10 years (slope)	-0.004		0.014	-0.004		0.014	-0.003		0.014
Duration since childbirth									
0-6 years (slope)	-0.007		0.027	-0.007		0.027	-0.008		0.027
6-10 years (slope)	0.007		0.040	0.007		0.041	0.008		0.041
>10 years (slope)	-0.022		0.018	-0.022		0.018	-0.022		0.018
Cohort (ref. 1948-1958)									
1959-1968	0.553	***	0.091	0.554	***	0.091	0.565	***	0.091
1969-1978	1.081	***	0.129	1.083	***	0.129	1.098	***	0.129
1979-1993	1.516	***	0.167	1.519	***	0.167	1.539	***	0.168
Calendar period (ref. Before 1980)									
1980-1989	-0.173		0.143	-0.172		0.144	-0.184		0.144
1990-1999	-0.251		0.157	-0.252		0.158	-0.270	*	0.158
2000-2009	-0.557	***	0.176	-0.558	***	0.178	-0.579	***	0.178
Ever had adopted/foster children and/or stepchildren (ref. No)									
Yes	0.503	*	0.259	0.500	*	0.259	0.543	**	0.263
Macroarea of residence (ref. North)									
Centre	0.081		0.071	0.081		0.071	0.081		0.071
South	-0.377	***	0.070	-0.378	***	0.071	-0.381	***	0.071
Parental education (ref. Low-Medium)									
High education	0.478	***	0.071	0.479	***	0.071	0.483	***	0.072
Education (ref. Low)									
Medium education	0.060		0.080	0.060		0.080	0.058		0.080
High education	0.256	***	0.094	0.258	***	0.094	0.260	***	0.094
Parental separation/divorce (ref. No)									
Yes	0.760	***	0.107	0.759	***	0.107	0.766	***	0.109

Union order	0.010		0.101	0.012		0.101	-0.003		0.101
Type of union (ref. Cohabitation)									
Marriage	-0.779	***	0.074	-0.779	***	0.074	-0.776	***	0.074
Marriage preceded by cohabitation (ref. No)									
Yes	0.486		0.000	0.486		0.000	0.486		0.000
Number of children had in previous unions	0.058		0.079	0.058		0.080	0.031		0.080
Number of children of the couple (ref. 0 children)									
1 child	-0.487	***	0.111	-0.488	***	0.112	-0.511	***	0.112
2 or more children	-0.685	***	0.130	-0.686	***	0.130	-0.725	***	0.131
Child sex composition (ref. All females)									
Both sexes	-0.170		0.121	-0.170		0.121	-0.165		0.121
All males	-0.103		0.087	-0.102		0.087	-0.103		0.088
Employment (ref. Not working)									
Working	0.176	***	0.059	0.176	***	0.059	0.170	***	0.059
Heterogeneity term							0.215	***	0.014

Table A2.10 – Coefficient estimates and standard errors of the two-equation specification. Men; Model 0-3.

Explanatory variables	Model 0 Coeff.		Std. error	Model 1 Coeff.		Std. error	Model 2 Coeff.		Std. error	Model 3 Coeff.		Std. error
Fertility												
Intercept	-6.119	***	0.102	-6.121	***	0.102	-6.239	***	0.106	-6.249	***	0.106
Duration since previous childbirth												
0-3 years (slope)	1.027	***	0.029	1.027	***	0.029	1.026	***	0.029	1.026	***	0.029
3-5 years (slope)	0.448	***	0.019	0.448	***	0.019	0.470	***	0.019	0.471	***	0.019
>5 years (slope)	0.069	***	0.002	0.069	***	0.002	0.077	***	0.002	0.078	***	0.003
Duration since union formation												
0-2 years (slope)	0.404	***	0.027	0.404	***	0.027	0.419	***	0.027	0.419	***	0.027
2-4 years (slope)	-0.256	***	0.016	-0.256	***	0.017	-0.248	***	0.017	-0.248	***	0.017
>4 years (slope)	-0.385	***	0.003	-0.385	***	0.003	-0.392	***	0.004	-0.393	***	0.004
Cohort (ref. 1948-1958)												
1959-1968	0.087	***	0.021	0.087	***	0.021	0.090	***	0.024	0.089	***	0.024
1969-1978	0.189	***	0.028	0.189	***	0.028	0.203	***	0.031	0.200	***	0.032
1979-1993	0.194	**	0.080	0.195	**	0.081	0.203	**	0.083	0.198	**	0.083
Macroarea of residence (ref. North)												
Centre	0.026		0.023	0.026		0.023	0.026		0.026	0.027		0.026
South	0.118	***	0.020	0.118	***	0.021	0.111	***	0.023	0.111	***	0.023
Education (ref. Low)												
Medium education	-0.004		0.025	-0.004		0.025	0.003		0.029	0.003		0.029
High education	0.004		0.029	0.004		0.029	0.016		0.032	0.014		0.033
Age (ref. 15-22 years)												
23-27 years	-0.653	***	0.051	-0.652	***	0.052	-0.719	***	0.053	-0.723	***	0.053
28-34 years	-1.221	***	0.054	-1.220	***	0.055	-1.339	***	0.059	-1.348	***	0.059
35 years or more	-1.627	***	0.059	-1.626	***	0.059	-1.787	***	0.066	-1.796	***	0.066
Number of children	1.402	***	0.006	1.401	***	0.006	1.491	***	0.013	1.499	***	0.013
Type of union (ref. Direct marriage)												
Cohabitation	-0.705	***	0.048	-0.705	***	0.048	-0.692	***	0.050	-0.688	***	0.050
Marriage subsequent cohabitation	-0.376	***	0.030	-0.375	***	0.030	-0.366	***	0.035	-0.367	***	0.035
Not in union (single)	-3.492	***	0.049	-3.492	***	0.050	-3.471	***	0.052	-3.458	***	0.052
Number of children of previous union	-1.272	***	0.036	-1.271	***	0.037	-1.338	***	0.039	-1.336	***	0.039

Employment (ref. Not working)												
Working	-0.065	**	0.031	-0.065	**	0.031	-0.069	**	0.033	-0.068	**	0.033
Dissolution of union												
Intercept	-2.925	***	0.208	-2.928	***	0.208	-2.932	***	0.210	-2.928	***	0.208
Duration of union												
0-3 years (slope)	0.025		0.036	0.026		0.036	0.033		0.036	0.026		0.036
3-7 years (slope)	0.005		0.032	0.005		0.032	0.008		0.032	0.005		0.032
7-10 years (slope)	0.011		0.047	0.012		0.047	0.014		0.047	0.012		0.047
>10 years (slope)	0.006		0.013	0.006		0.014	0.007		0.014	0.007		0.014
Duration since childbirth												
0-6 years (slope)	0.013		0.032	0.013		0.032	0.011		0.032	0.013		0.032
6-10 years (slope)	0.052		0.046	0.052		0.046	0.053		0.046	0.052		0.046
>10 years (slope)	-0.065	***	0.022	-0.065	***	0.023	-0.065	***	0.023	-0.065	***	0.023
Cohort (ref. 1948-1958)												
1959-1968	0.459	***	0.082	0.461	***	0.082	0.461	***	0.083	0.461	***	0.082
1969-1978	0.920	***	0.113	0.924	***	0.114	0.924	***	0.115	0.923	***	0.114
1979-1993	1.411	***	0.154	1.416	***	0.155	1.422	***	0.156	1.416	***	0.155
Calendar period (ref. Before 1980)												
1980-1989	-0.030		0.172	-0.035		0.173	-0.037		0.173	-0.034		0.173
1990-1999	-0.233		0.176	-0.240		0.177	-0.241		0.178	-0.239		0.177
2000-2009	-0.390	**	0.184	-0.399	**	0.185	-0.400	**	0.186	-0.398	**	0.186
Ever had adopted/foster children and/or stepchildren (ref. No)												
Yes	0.593	***	0.186	0.595	***	0.187	0.623	***	0.191	0.596	***	0.187
Macroarea of residence (ref. North)												
Centre	0.057		0.071	0.058		0.071	0.058		0.072	0.057		0.071
South	-0.201	***	0.067	-0.201	***	0.067	-0.198	***	0.068	-0.201	***	0.068
Parental education (ref. Low-Medium)												
High education	0.387	***	0.070	0.387	***	0.070	0.395	***	0.071	0.387	***	0.070
Education (ref. Low)												
Medium education	0.092		0.080	0.094		0.080	0.092		0.081	0.093		0.080
High education	0.230	**	0.091	0.232	**	0.091	0.231	**	0.092	0.232	**	0.091
Parental separation/divorce (ref. No)												
Yes	0.172		0.155	0.170		0.155	0.176		0.158	0.171		0.155

Union order	0.215	***	0.064	0.221	***	0.064	0.207	***	0.065	0.221	***	0.064
Type of union (ref. Cohabitation)												
Marriage	-1.329	***	0.067	-1.332	***	0.068	-1.333	***	0.068	-1.332	***	0.068
Marriage preceded by cohabitation (ref. No)												
Yes	0.465		0.000	0.465		0.000	0.465		0.000	0.465		0.000
Number of children had in previous unions	-0.251	***	0.073	-0.254	***	0.075	-0.275	***	0.075	-0.253	***	0.075
Number of children of the couple (ref. 0 children)												
1 child	-1.128	***	0.128	-1.127	***	0.129	-1.144	***	0.129	-1.127	***	0.129
2 or more children	-1.406	***	0.164	-1.406	***	0.166	-1.435	***	0.167	-1.406	***	0.167
Child sex composition (ref. All females)												
Both sexes	0.079		0.150	0.079		0.150	0.082		0.151	0.079		0.151
All males	0.192	*	0.105	0.193	*	0.106	0.192	*	0.106	0.193	*	0.106
Employment (ref. Not working)												
Working	-0.563	***	0.075	-0.562	***	0.075	-0.569	***	0.076	-0.562	***	0.075
Heterogeneity term							0.200	***	0.015			
Heterogeneity term for fertility										0.208	***	0.015
Heterogeneity term for union dissolution										1.1E-97		1.1E+15

APPENDIX B1 METHODOLOGICAL NOTES

B1.1 Missing variables

Given the sampling nature of the data, a special attention was paid for handling missing data of partially observed respondents. First, nearly all socio-demographic characteristics of women were retrieved through the random sample, which included some relevant information such as the age, the citizenship, the place of residence, and the educational level. Second, all remaining missing data were imputed.

In Table B1 all explanatory variables with missing values are reported. To be noticed that all of them had few missing, which accounted for less than 6.5% of total, except the willingness to recommend question about postnatal services. In this case, about 22% of observations did not answer to this question. The lacking answer has mainly depended on a substantial number of women that enjoyed only few services among those proposed by the health district. For this reason, many women probably skipped this part of the questionnaire or just some questions, thus having a high non-response.

The underlying hypothesis to the imputation procedure of missing values was that the missing data be missing at random (MAR). Under MAR, the missing-data values do not contain any additional information given observed data about the missing-data mechanism. When missing data are MAR, listwise deletion may lead to biased results (Rubin 1976).

Table B1.1 – Variables with missing values. Absolute numbers and percentage values.

Women	Variable description	Number of missing values	% missing values
All women			
	Age	7	0.15
	Education	3	0.07
	Number of previous pregnancies	131	2.85
	Health district	1	0.02
	Confidence towards doctors	134	2.91
	Confidence towards nurses	242	5.26
	Confidence towards midwives	89	1.94
	Overall satisfaction during delivery	61	1.33
	Preterm delivery	83	1.81
	Type of delivery	63	1.37
	Out-of-Local-Health Authority delivery	1	0.02
	Accordant information about breastfeeding	171	3.72
	Pain control	197	4.28
	Alone during labour or delivery	265	5.76
	Skin-to-skin contact after delivery	100	2.17
	Mother and new-born together during hospital stay	53	1.15
Resident women			
	Presentation of the birth path and the services offered by your Local Health Authority	64	1.43
	Satisfaction towards the course preparing for birth	36	0.81
	Overall satisfaction during pregnancy	40	0.90
	Has visited the birth centre	34	0.76
	Pathological pregnancy	17	0.38
	Number of echographies	271	6.07
	Willingness to recommend postpartum services	989	22.14

Note: in the table, only the explanatory variables that had some missing values were reported.

Various procedures have been suggested in the literature over the last several decades to deal with missing data (i.e., Anderson 1957; Rubin 1972; Rubin 1987). The technique of multiple imputation (MI), which is a flexible, simulation-based statistical technique for handling missing data, has gained popularity increasingly over the years (Rubin 1976; Rubin 1987).

Multiple imputation consists of three steps. First, a given number of completed datasets are generated under some chosen imputation model. Second, the completed-data analysis is performed, namely the data are analysed separately on each imputation. Third, the results obtained from all completed-data analyses are combined into a single multiple-imputation result.

The theory underlying the validity of multiple imputation relies on an infinite number of imputations. In practice, however, the number M of imputations tends to be small, because the procedure is also known to have good statistical properties with finite M. According to Rubin (1987), the asymptotic relative efficiency (RE) of the MI procedure with finite M compared with infinite M is roughly 90% with only two imputations for a missing-information rate as high as 50%. Nevertheless, the actual number of imputations necessary for MI to perform satisfactorily depends

not only on the amount of information missing due to nonresponse but also on the analysis model and the data (Horton and Lipsitz 2001; Kenward and Carpenter 2007). Given that most literature - for example, Rubin (1987) and van Buuren, Boshuizen, and Knook (1999) - suggests that M = 5 (corresponding to RE of 95% for 50% of information missing) should be sufficient to obtain valid inference.

In this work, twenty imputations were performed, according to the chosen imputation method that assumed that missing data were MAR. Then, the imputation step was performed for multiple variables. Socio-demographic covariates, which were common to all three phases, namely pregnancy, delivery, and post-partum, were imputed together. Then, covariates were divided according to each phase, and imputed through a multivariate imputation separately[28]. Where possible, the missing observations have been estimated only considering the observations of the same health district, in such a way to take into account potential territorial differences in the supplied services.

Given that the pattern of missing values was arbitrary, iterative methods were used to fill in missing values. The chosen multivariate imputation method was multivariate imputation using chained equations (MICE), one of the most popular choices used in practice, also known as imputation using fully conditional specifications (van Buuren, Boshuizen and Knook 1999) and as sequential regression multivariate imputation (Raghunathan et al. 2001). The MICE method used a Gibbs-like algorithm to impute multiple variables sequentially using univariate fully conditional specifications. Thus, to impute categorical variables, logistic, ordered logistic, or multinomial logistic regressions were used. To impute discrete variables, Poisson regression was used.

Unfortunately, various post-estimation procedures are not directly applicable to MI results. Given the complexity of the analyses in implementing the ecometric approach, the whole set of analyses were performed only using the first completed dataset, thus adopting a single-imputation method.

Single-imputation methods do not discard missing values, but it represents one set of plausible values for missing data, whereas multiple imputations represent multiple sets of plausible values. This underestimates the variance of the estimates and so overstates precision and results in confidence intervals and significance tests that are too optimistic. To verify the reliability of this approach, Model 1[29] of each phase – pregnancy, delivery and post-partum – was compared with the

[28] The separate imputation of the variables related to pregnancy, delivery, and post-partum period has been adopted given that they were subsequent applied in separate models. Nevertheless, the covariates included in the model for pregnancy were divided in two groups and imputed separately, because of estimation problems (the algorithm did not converge otherwise). This choice implied that the two groups of variables were independent; given that this assumption was too strong, the groups were chosen in such a way to minimize the dependence each other.

[29] Model 1 is the model with only socio-demographic covariates included.

same Model obtained by multiple imputation. In Table B1.2-B1.4 both results are reported. From the comparison of the two sets of models, it emerged that all coefficients obtained by the single imputation were included in the confidence interval for the same coefficients estimated from the multiple imputation; even the significance of all coefficients were confirmed by the multiple imputation results, where in few cases they were more optimistic[30]. To sum up, the comparison between the two analyses confirmed the reliability of results from the single imputation, and justified the performed analyses.

Table B1.2 - Random intercept proportional odds model on the overall satisfaction towards services and assistance during pregnancy. Model 1 results from single imputation and multiple imputation.

Response	**Overall prenatal satisfaction**							
Units: health district	34			34				
Units: woman	4467			4467				
	Single imputation			Multiple imputation				
	Coeff.	S.E.		Coeff.	S.E.		L.B.	U.B.
Fixed Part								
Threshold								
First	-5.446	0.242	***	-5.433	0.242	***	-5.906	-4.959
Second	-3.641	0.111	***	-3.636	0.111	***	-3.854	-3.417
Third	-1.412	0.066	***	-1.414	0.066	***	-1.544	-1.285
Fourth	1.335	0.065	***	1.331	0.065	***	1.203	1.459
Patient demographics								
Age (centred at the median age)	0.030	0.007	***	0.029	0.007	***	0.016	0.042
Age^2 (centred at the median age)	0.003	0.001	***	0.003	0.001	***	0.001	0.005
Citizenship (Ref. Italian)								
Strong migratory country	0.288	0.112	***	0.264	0.113	**	0.042	0.487
Western Country	-0.515	0.272	**	-0.511	0.275	*	-1.049	0.028
Education (Ref. Medium)								
Low	-0.212	0.095	**	-0.227	0.096	**	-0.416	-0.039
High	0.176	0.064	***	0.178	0.064	***	0.052	0.304
Number of previous pregnancies	-0.018	0.026		-0.021	0.026		-0.073	0.030
Random Part								
Level: health district								
Variance	0.025	0.013		0.024	0.013		0.009	0.068

[30] The only difference was for the age of the respondent, which resulted significant in the multiple imputation analysis while it was not for the single imputation.

Table B1.3 - Random intercept proportional odds model on the overall satisfaction towards services and assistance during delivery. Model 1 results from single imputation and multiple imputation.

Response	**Overall delivery satisfaction**							
Units: hospital (birth centre)	25			25				
Units: woman	4598			4598				
	Single imputation			Multiple imputation				
	Coeff.	S.E.		Coeff.	S.E.		L.B.	U.B.
Fixed Part								
Threshold								
First	-4.267	0.151	***	-4.284	0.153	***	-4.584	-3.984
Second	-3.046	0.115	***	-3.052	0.116	***	-3.278	-2.825
Third	-1.631	0.100	***	-1.630	0.101	***	-1.828	-1.432
Fourth	0.461	0.097	***	0.465	0.098	***	0.273	0.656
Patient demographics								
Age (centred at the median age)	0.010	0.006		0.010	0.006	*	-0.002	0.022
Citizenship (Ref. Italian)								
Strong migratory country	0.108	0.104		0.098	0.105		-0.108	0.304
Western Country	-0.434	0.248	*	-0.454	0.251	*	-0.945	0.037
Education (Ref. Medium)								
Low	0.101	0.088		0.094	0.088		-0.079	0.267
High	0.056	0.061		0.058	0.061		-0.062	0.178
Number of previous pregnancies	0.000	0.024		0.006	0.025		-0.042	0.055
Random Part								
Level: hospital								
Variance	0.173	0.058		0.175	0.058		0.091	0.336

Table B1.4 - Random intercept proportional odds model on the willingness to recommend post-natal services. Model 1 results from single imputation and multiple imputation.

Response	**Willingness to recommend post-partum services**							
Units: health district	34			34				
Units: woman	4401			4401				
	Single imputation			Multiple imputation				
	Coeff.	S.E.		Coeff.	S.E.		L.B.	U.B.
Fixed Part								
Threshold								
First	-2.961	0.094	***	-2.970	0.099	***	-3.164	-2.775
Second	-1.436	0.075	***	-1.445	0.082	***	-1.606	-1.283
Patient demographics								
Age (centred at the median age)	0.010	0.008		0.009	0.009		-0.008	0.027
Citizenship (Ref. Italian)								
Strong migratory country	-0.290	0.128	**	-0.284	0.135	**	-0.548	-0.020
Western Country	-0.458	0.309		-0.465	0.332		-1.117	0.187
Education (Ref. Medium)								
Low	-0.054	0.117		-0.105	0.121		-0.342	0.133
High	-0.161	0.081	**	-0.170	0.090	*	-0.348	0.007
Number of previous pregnancies	0.053	0.034		0.047	0.038		-0.028	0.121
Random Part								
Level: health district								
Variance	0.043	0.023		0.047	0.027		0.015	0.142

B1.2 Sensitivity analysis

As stated in §10.1, the random sample of women was formed by 12,355 women, who were invited to participate to the survey. Among those, 4,598 responded to the questionnaire (37,23%): even if they exceeded the expected response rate of 25%, a deeper analysis was necessary to understand why so many women did not answer the questionnaire. More specifically, did women who answered the questionnaire be more satisfied than women who did not? Even if the information about women's satisfaction was lacking, the random sample contained some information that could be used to verify if respondents significantly differed from the non-respondents.

The implemented sensitivity analysis proceeded along the potential-outcome framework for causal inference (Rubin 1974), translated into the participation or not to the survey. The idea was to impute non-respondents' satisfaction towards each phase – pregnancy, delivery and post-partum – on the basis of some known socio-demographic covariates for all women, and to verify if it differed compared to respondents' satisfaction. More formally, the underlying hypothesis was the conditional independence assumption, namely that the outcome for who did not answer the questionnaire did not influence outcome results, given a set of covariates.

The first step of sensitivity analysis consisted in estimating the propensity score, which was the individual probability of answering the questionnaire given the observed covariates. Usually unknown, it needed to be estimated through some probabilistic model. Such a model should have included all the observable variables that influenced both the selection into responsiveness and the outcome. In this case, the propensity score was estimated through a logistic regression with the citizenship, the age class, and the educational level as covariates, which resulted significant for the selection into responsiveness (Becker and Ichino 2002).

Along the potential-outcome framework, the Average Treatment Effect (ATE) was the average effect of answering or not to the questionnaire. Given that the outcome (namely, women's satisfaction) was observed only for respondents, to estimate the unobserved potential outcome for each observation in the sample was necessary for evaluating the average treatment effect. If the decision to answer to the questionnaire was "purely random" for individuals with similar values of the covariates, the average outcome of some similar individuals who answered could be used to estimate the non-respondents' outcome, through the use of the so called "matching estimators" (Abadie et al. 2004).

Thus, as second step matching estimators were used to impute the missing outcome by finding other individuals in the data whose covariates were similar but who were exposed to the other responsiveness condition. The variables used for matching respondents and non-respondents were

the previously computed propensity score and the health district/the hospital in which the delivery took place. The health district was used in estimating the missing outcomes in satisfaction towards prenatal services and willingness to recommend postnatal services. The hospital was employed in estimating the missing outcome in satisfaction during delivery.

To ensure that the matching estimators identified and consistently estimated the outcome of interest, it was assumed that missingness was independent of the outcomes, conditional on the covariates, and that the probability of assignment was bounded away from zero and one (Abadie and Imbens 2002).

The average treatment effect did not result significantly different from zero (at 5%) in each phase of the process, thus giving the impression that the sample of respondents was not selected in comparison with non-respondents[31].

Next to the hypothesis test on ATE, three ordinal logistic regression were estimated for pregnancy, delivery, and post-partum, where the response variable was the satisfaction during each phase (the true satisfaction for respondents and the imputed one for non-respondents), and just one binary covariate indicating if the observation was a respondent or not to the survey. In all three models, the covariate was never significant, thus confirming that the sample of respondents was not selected, and the implicit validity of the conducted analyses. Even more, another version of the three ordinal logistic regression was implemented, where the covariate indicated if the observation was a respondent to the survey, a respondent with a missing value in the question about satisfaction, or if she was a non-respondent. In this case, no significant differences emerged for satisfaction towards pregnancy and delivery, but it aroused for postpartum period. Compared to respondents, both non respondents and respondents with missing value in the response variable seemed to be less inclined to recommend postnatal services.

To sum up, the sample of women who answered the survey did not appear a selected group compared to all women invited to participate. Then, the validity of the analyses for pregnancy and delivery periods was largely confirmed by sensitivity analysis, both for non-respondents and respondents who did not answer about their satisfaction. Instead, for the postnatal phase, women who answered to the question about the willingness to recommend those services could be a selected group among all contacted women, because were the most satisfied towards postnatal services.

[31] Nevertheless, for postpartum period the average treatment effect was significantly different from zero at 10%. This results suggested that the sample of respondents could be selected for postnatal services. Unfortunately, the subsequent analysis confirmed this impression.

Table B1.5 – Results for ordinal logistic models. Pregnancy, delivery and post-partum period.

	Overall prenatal satisfaction		Overall delivery satisfaction		Willingness to recommend postpartum services		
Model 1	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	
Threshold							
First	-6.448	0.238	-5.124	0.122	-3.678	0.070	
Second	-4.658	0.101	-3.922	0.071	-1.800	0.044	
Third	-2.312	0.044	-2.381	0.041			
Fourth	1.927	0.041	1.114	0.033			
Non respondents	0.005	0.047	-0.026	0.040	0.052	0.056	
Model 2							
Threshold							
First	-6.455	0.238	-5.127	0.122	-3.880	0.077	
Second	-4.665	0.102	-3.925	0.071	-1.996	0.053	
Third	-2.318	0.044	-2.384	0.042			
Fourth	1.921	0.041	1.111	0.033			
Non respondents	-0.529	0.351	-0.208	0.280	-0.732	0.094	***
Respondents with missing values	-0.001	0.047	-0.029	0.040	-0.145	0.063	**

APPENDIX B2 TABLES

Table B2.1 – Ecometric model for pregnancy. Results from first imputation and multiple imputation. Coefficients, standard errors and confidence intervals.

Units: item	6946					6942/6949			
Units: woman	4467					4467			
	First imputation					Multiple imputation			
	Coeff.	S.E.		LI	UI	Coeff.	S.E.		LI	UI
Fixed Part										
Constant	3.476	0.028	***	3.421	3.530	3.475	0.028	***	3.420	3.529
item2	0.424	0.022	***	0.381	0.467	0.427	0.022	***	0.383	0.470
Random Part										
Level: health district										
Standard deviation	0.121	0.025		0.08	0.183	0.116	0.025		0.076	0.176
Level: woman										
Standard deviation	0.405	0.015		0.377	0.435	0.393	0.014		0.366	0.422
Level: item										
Standard deviation (item1)	1.112	0.013		1.087	1.138	1.117	0.013		1.092	1.142
Standard deviation (item2)	0.39	0.056		0.295	0.515	0.433	0.048			

Notes:
item1: presentation of the birth path and the services offered by your Local Health Authority
item2: satisfaction towards the course preparing for birth
* p-value<0.10, ** p-value<0.05, *** p-value<0.01

Table B2.2 – Ecometric model for delivery. Results from first imputation and multiple imputation. Coefficients, standard errors and confidence intervals.

Units: item	13794					13794			
Units: woman	4598					4598			
	First imputation					Multiple imputation			
Fixed Part	Coeff.	S.E.		LI	UI	Coeff.	S.E.		LI	UI
Constant	4.076	0.034	***	4.010	4.142	4.076	0.034	***	4.010	4.142
item2	-0.114	0.016	***	-0.146	-0.083	-0.115	0.016	***	-0.147	-0.083
item3	0.176	0.015	***	0.146	0.204	0.175	0.015	***	0.146	0.204
Random Part										
Level: hospital										
Standard deviation	0.156	0.025		0.113	0.214	0.153	0.025		0.111	0.211
Level: woman										
Standard deviation	0.301	0.004		0.294	0.308	0.301	0.004		0.294	0.308
Level: item										
Standard deviation (item1)	0.783	0.008		0.767	0.800	0.783	0.008		0.767	0.800
Standard deviation (item2)	0.702	0.009		0.684	0.72	0.701	0.009			
Standard deviation (item3)	0.079	0.078		0.012	0.542	0.110	0.063			

Notes:
item1: confidence towards doctors
item2: confidence towards nurses
item3: confidence towards midwives
* p-value<0.10, ** p-value<0.05, *** p-value<0.01

Table B2.3 – Model for delivery. Only resident women.

Response	**Overall delivery satisfaction**					
Units: hospital (birth centre)	25			25		
Units: woman	4467			4467		
	Model 2			Model 3		
	Coeff.	S.E.		Coeff.	S.E.	
Fixed Part						
Threshold						
First	-5.975	0.196	***	-4.701	1.375	***
Second	-4.493	0.159	***	-3.218	1.370	**
Third	-2.611	0.144	***	-1.336	1.369	
Fourth	0.349	0.136	***	1.623	1.368	
Patient demographics						
Age (centred at the median age)	-0.001	0.007		-0.001	0.007	
Citizenship (Ref. Italian)						
Strong migratory country	0.272	0.148	*	0.281	0.148	*
Western Country	0.033	0.361		0.036	0.361	
Education (Ref. Medium)						
Low	0.077	0.165		0.079	0.165	
High	0.184	0.113		0.190	0.113	*
Number of previous pregnancies	-0.011	0.027		-0.012	0.027	
Patient experience and clinic						
Overall pregnancy satisfaction (Ref. Fair)						
Very poor	-2.314	0.489	***	-2.320	0.489	***
Poor	-0.805	0.228	***	-0.815	0.228	***
Good	0.728	0.086	***	0.727	0.086	***
Excellent	2.069	0.111	***	2.061	0.111	***
Type of delivery (Ref. Vaginal)						
Assisted (with cupping glass or forceps)/Induced	-0.107	0.119		-0.104	0.119	
Scheduled Caesarean section	-0.510	0.144	***	-0.509	0.144	***
Not scheduled Caesarean section	-0.454	0.152	***	-0.453	0.152	***
Accordant information about breastfeeding (Ref. Yes)						
Somewhat	-0.893	0.072	***	-0.882	0.072	***
No	-1.906	0.102	***	-1.891	0.102	***
No information	-2.045	0.133	***	-2.022	0.133	***
Pain control (Ref. Yes)						
Somewhat	-0.705	0.100	***	-0.694	0.100	***
No	-1.153	0.158	***	-1.155	0.158	***
Alone during labour or delivery	-1.033	0.164	***	-1.034	0.165	***
No skin-to-skin contact after delivery	-0.333	0.097	***	-0.326	0.097	***
SMC citizenship # Assisted delivery[a)]	-0.639	0.304	**	-0.660	0.303	**
High education # Assisted delivery[a)]	0.302	0.176	*	0.299	0.176	*
Low education # Alone during labour or delivery[a)]	0.604	0.353	*	0.607	0.353	*
High education # Somewhat pain control[a)]	-0.409	0.145	***	-0.417	0.145	***
High education # No pain control[a)]	-0.682	0.223	***	-0.666	0.223	***
Hospital characteristics						

Scale of intermediate satisfaction[b)]			1.694	0.390	***
Random Part					
Level: hospital					
Variance	0.105	0.040	0.041	0.020	

Notes:
a) For interaction terms, only significant values are reported on the table.
b) The scale of intermediate satisfaction is given by third level residuals of the ecometric model.
From Model 2 we controlled also for other four individual-level covariates, preterm delivery, the out-of-Local Health Authority delivery, if the mother and newborn were together during hospital stay, and the typology of the questionnaire, but they were not significant.
In Model 3 we controlled also for another hospital-level covariate, the percentage of breastfeeding within 2 hours from delivery, but it was not significant.
* p-value<0.10, ** p-value<0.05, *** p-value<0.01

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