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Parents, Children and Childbearing

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Johan Dahlberg
Stockholm, New Year's Day 2016

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List of empirical studies

Study I Dahlberg, J. (2013). Family Influence in Fertility: A Longitudinal Analysis of Sibling Correlations in First Birth Risk and Completed Fertility among Swedish Men and Women. *Demographic Research*, *29*, 233-246.

Study II Dahlberg, J. (2015). Social Background and Becoming a Parent in Sweden: A Register-Based Study of the Effect of Social Background on Childbearing in Sweden. *European Journal of Population*, *31*(4), 417-444.

Study III Elvander, C., Dahlberg, J., Andersson, G. and Cnattingius, S. (2015). Mode of delivery and the probability of subsequent childbearing: a population-based register study. *BJOG: An International Journal of Obstetrics and Gynaecology*, 122(12), 1593-1600.

Study IV Dahlberg, J. (2016). Does Parental Death Affect Fertility? A Register-Based Study of the Effect of Parental Death on Adult Children's Childbearing Behavior in Sweden. *Stockholm Research Reports in Demography*, 2016:01. Stockholm: Stockholm University.

1. Introduction

The general topic of this doctoral dissertation is social influences on fertility timing. It consists of four chapters and this introduction, in which I will describe the existing knowledge on fertility behaviors and how the four papers are connected. My main interest is in the timing of first births, although I also consider the progression to higher-order parities.

Life course research stresses the importance of the timing of life transitions and argues that life courses are affected by previous life experiences, networks of social relations, and historical context, which condition how individual lives unfold (Elder and Johnson 2003). The research presented in this dissertation can be placed within this tradition. The first two studies analyzed parental background influences on fertility. Study I estimated the total family background effect on fertility, and Study II analyzed how different dimensions of parental background are associated with entry into parenthood. The third and fourth studies took a different perspective on the role of life experiences. Study III analyzed how the mode of delivery of the first child is related to subsequent fertility, and Study IV explored how a parental death is associated with the transition to first birth. These studies contribute to the research on fertility by analyzing predictors of fertility, which hitherto have received little attention.

Fertility is one of three population processes that together produce changes in the population structure and therefore is a central topic in demography. It has also received considerable attention in neighboring fields, such as sociology, anthropology, economics, medicine, and psychology. Most people become parents, but an understanding of what determines the timing of entry into parenthood is important from both individual and macro-level perspec-

tives. The age at which people become parents can have an impact on both their final family size and the total fertility rate in a society. The same event can have different implications for different individuals depending on when in life it occurs (Elder 1998). Early entry into parenthood has often been associated with poorer socioeconomic outcomes (Hoffman 1998), and postponement of childbearing may be beneficial for individuals' educational and occupational careers (Härkönen and Bihagen 2011). However, postponement of first births is not completely without risk for the health of mothers and children (Cnattingius and Stephansson 2002). Postponement of first births can also lead to lower ultimate fertility and increased childlessness (Andersson et al. 2009) and contribute to aggregate fertility trends (te Velde et al. 2012). Another consequence of the timing of parenthood is that it may affect the intergenerational reproduction of (dis)advantage (McLanahan and Percheski 2008).

In the next section, I will briefly anchor my thesis in the field of demography. In the third section, I will present my motives for studying fertility timing. In the fourth section, I will describe existing knowledge on fertility timing. In sections five and six, I will describe my data and methods, and summarize the findings of my four empirical studies. In the seventh and final section, I will bring my four studies together and discuss some implications for future research.

2. Demography and fertility

Demography can be defined in narrow and broad senses. The former is mainly concerned with the collection and analysis of data, while the latter implies a wider frame of references to neighboring fields (Kirk 1968; Ross 1982; Petersen and Petersen 1985; Szreter 2001). In its narrowest definition, demography refers to the mathematical study of human population and the processes of population change—fertility, mortality, and migration. Sometimes the narrow definition of demography is referred to as the "formal" definition of demography and can be expressed by the *population balancing equation* (sometimes referred to as *the demographic equation*):

$$P_t \equiv P_{t-1} + B_{t-1\ to\ t} - D_{t-1\ to\ t} + NM_{t-1\ to\ t} \qquad (1)$$

where P_t and P_{t-1} denote the size of a population at the beginning and end of a period, and $B_{t-1to\ t}$, $D_{t-1\ to\ t}$, and $NM_{t-1\ to\ t}$ denote the flows into or out of the population from time *t*-1 to t by births, deaths, and net migration (Hofsten 1982: 8; Poston and Bouvier 2010: 5-14). The meaning of the population balancing equation (1)—that the population at time *t* is equal to the population at time *t*-1 plus the births between time *t*-1 and t minus the deaths and net migrations between time *t*-1 and *t*—is rather trivial, and it is possible to show that it is an instance of the general law of conservation of mass in physics (Land and Schneider 1987).

In the broader definition, demography is the study of population and the relationship between population processes and other social factors. Demographic research that fits under this type of definition is often referred to as social demography. In its early development, social demography drew heavi-

ly on biological and sociological research in the study of fertility, on medical and health sciences in the study of mortality, and economics and geography for studying migration. Social demography is often an interdisciplinary discipline that contributes knowledge to or retrieves theory and knowledge from neighboring fields such as sociology, economics, geography, planning and development, biology, anthropology, criminology, and medicine. In studies combining one or more demographic variables with variables from neighboring disciplines, demographic variables can be both independent and dependent. The distinction between formal and social demography is not a binary one. Instead, demographic research can be placed anywhere on a scale between the two extremes (Ross 1982: 147).

Although demography has its own concepts, techniques, journals, and associations, it is not always regarded as a separate academic discipline. Before the second half of the twenty-first century, demography was generally not considered an independent discipline (Cardwell 1996). Hauser and Duncan (1959) identified three main reasons why demography was often not considered an independent academic subject. First, the wide range of disciplines from which demography draws makes it sometimes difficult to distinguish demography from other fields. Second, demographers' high degree of specialization within either government or academia makes a clear distinction of demography's borders even more difficult. Third, society's demands that demographers perform "non-scientific" tasks like producing and interpreting population data further hamper the possibility of considering demography an independent discipline (Hauser and Duncan 1959: 23).

In addition to being interdisciplinary, and both an academic and applied science, demography is characterized by being policy-oriented (Poterba et al. 1991) and method-developing.

2.1 Demographic study of fertility

The definition of *fertility* is not entirely unproblematic. In demography, fertility is defined as the number of children born to a woman. Physicians generally use the same word to refer to the natural capability to produce offspring. In demography, *fecundity* is used to describe the natural capability to reproduce. Demographers usually use the term *fertility* at an aggregate level, for instance to describe a society as a low-fertility or high-fertility society (Habbema et al. 2004).

The total fertility rate (TFR) is the average number of children that would be born per woman if all women lived to the end of their reproductive life and bore children according to the exact current age-specific fertility rates throughout their lifetimes. The advantage of the TFR is that it is a summary of the current fertility rates and therefore gives an up-to-date measurement of levels and trends in fertility. The TFR thus measures the fertility of a "synthetic cohort" of women based on observations during a calendar period. The actual childbearing of cohorts of women is given by the completed fertility rate (CCFR), which measures the average number of births of 50-year-old (or 45-year-old) women. CCFR has the capacity of representing past fertility experience. It is not up-to-date in the same way as the period TFR because cohorts currently aged 50 (or 45) had most of their children born twenty or thirty years earlier (Weeks 2005: 208-215).

The total fertility rate (TFR) consists of a quantum and a tempo component. The quantum component refers to the average number of children born to women in a cohort, and the tempo component to the timing of births by age of women within the cohort. Tempo can be measured by the mother's mean age at childbearing (Pressat 1985: 220) or by the mean ages at childbearing at each parity (Bongaarts and Feeney 1998). It has been known to demographers since Hajnal (1947) and Ryder (1964), and was reformulated by Bongaarts and Feeney (1998), that postponement or acceleration of childbearing can have substantial effects on the period TFR. Postponement

of childbearing to older ages reduces the number of births in a given period, lowering the TFR even if the completed cohort fertility remains unchanged. Changes in tempo (accelerated or postponed fertility) can also lead to changes in the quantum of fertility (on average larger or smaller final family size).

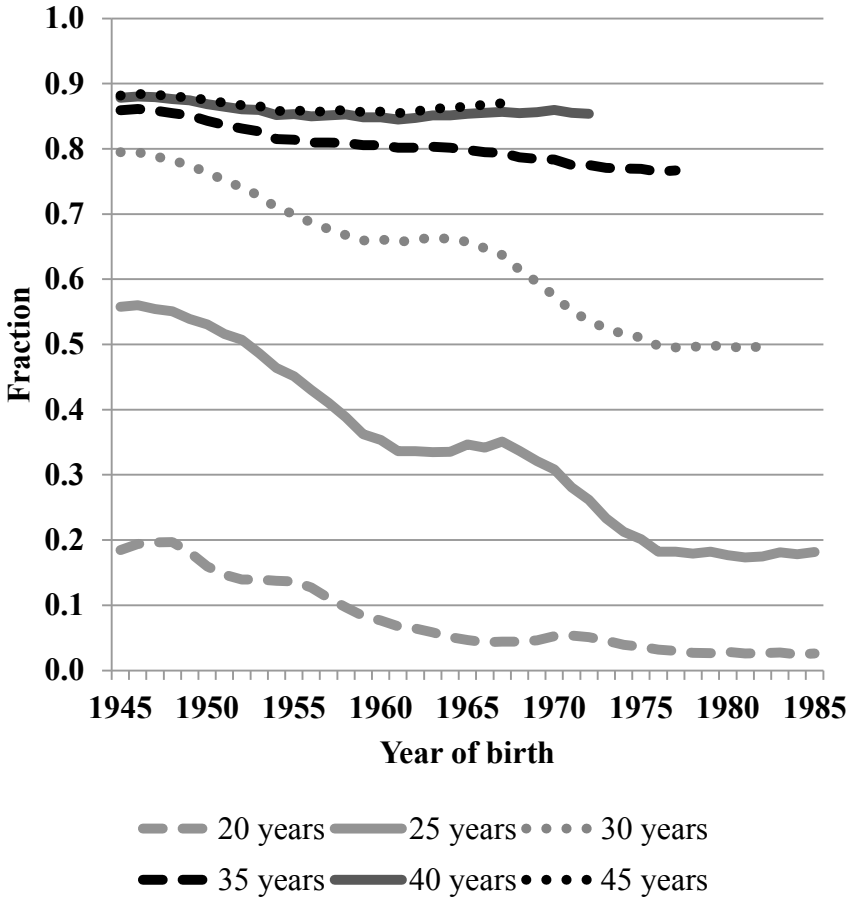
In this dissertation, the main focus is on tempo of fertility, although childlessness, progress to higher-order births, and the quantum of fertility are also addressed. The main focus is not on total fertility but on parity-specific fertility progressions.

3. Fertility timing

In virtually all industrialized countries, a significant increase in average age at first child occurred during the last two or three decades of the twenty-first century. In some countries this change toward a higher average age of first childbearing began in the 1970s, while other countries did not see this change until the 1990s (Frejka and Sobotka 2008; Mills et al. 2011). In Western Europe, the German-speaking countries and Scandinavia, the trend toward higher average age at first child began in the early 1970s, while the same development occurred in Southern Europe in the early 1980s and in the Anglo-Saxon countries and East-Central Europe at the end of the 1980s (Sobotka 2004). These increases toward higher ages at first birth occurred in the wake of previous declines. Sweden is no exception.

Figure 1 shows life-table estimates of the proportions of Swedish-born women born between 1945 and 1985 who had borne their first child by various ages. Among women born in Sweden in the second half of the 1940s, around 20% had become mothers by the time they turned 20, and more than half had done so by the time they turned 25. Among women born in the second half of the 1970s, less than 3% had become mothers by their twentieth birthday, and less than 50% had done so by her thirtieth birthday.

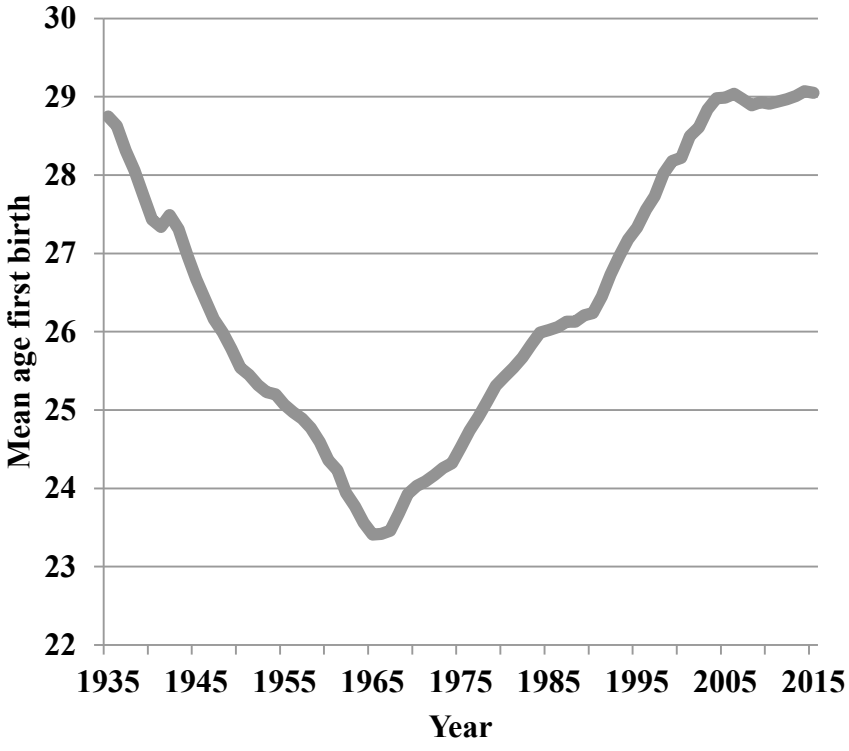
Figure 1: Life-table estimates of the proportion of women who have become a mother at different ages, Swedish birth cohorts 1945-1985.



Source: Swedish register data.

Among women born in Sweden in 1950, fewer than 14% were childless at age 45. This figure has hardly changed at all for women born in later cohorts (Statistics Sweden 2014: 68).

Figure 2: Average age of Swedish mothers at first birth, 1935-2015



Source: Swedish register data.

Figure 2 shows the mean age at first birth by calendar year 1935-2015 in Sweden. It is clear that there is a V-shaped pattern in the time series, with the lowest age at first birth occurring in the mid-1960s. As already pointed out, even though the postponement of first motherhood is persistent in Sweden and most other developed countries, the contemporary mean ages are not extreme in a historical comparison. Even if the mean age at first birth is higher today than in the 1960s, the average age at first birth during the beginning of the twenty-first century is similar to what it was almost a century earlier. It is rather the 1960s and 1970s that were the exception. It is also important to note that the average age of first birth stopped increasing in the

early 2000s. From 2003 until today, the average age of first-time mothers has been stable around 29 years of age.

However, there are strong reasons to investigate what factors affect the age at which people become parents. Postponement of entry into parenthood has been linked to not achieving the desired family size. Advanced maternal age has also been associated with negative effects for offspring's health. On the other hand, postponement of parenthood has been shown to be beneficial for parenting quality and parents' education and occupational careers.

3.1 Consequences of timing of parenthood

In this section, I will describe what is known about the impact of the timing of childbearing on various outcomes. The main focus is on the effects of the timing of fertility on individuals, both parents and their children, rather than the effects on society. However, as already mentioned, both accelerated and postponed childbearing can affect the overall TFR. The effects of the timing of parenthood described in this section focus on parity one. Other aspects relate to subsequent childbearing, birth intervals, and number of children. I will start this section by discussing the health and socioeconomic consequences of early and late entry into parenthood. I will also describe some potential effects on the children of young and old parents. I will end this section by discussing how family background effects on fertility can reproduce social inequality.

The greater part of research on the effects of timing of parenthood has focused on one of two extremes—teenage or very late parenthood—and most often linked these to negative consequences such as lower socioeconomic outcomes and risk of childlessness. It is of course no coincidence that these two extremes have received the most attention. The potentially negative effects of teenage or postponed parenthood should not be underestimated. However, I hope that this section can show that the timing of parenthood

influences a variety of outcomes for the parent and the child and that not all effects are necessarily negative.

Previous research has highlighted positive or negative effects of accelerated or postponed timing of parenthood. Thus, all of these findings on the influences of the timing of fertility on various outcomes can be regarded as motives for my thesis and for further research on fertility timing. I start by reporting on consequences of early parenthood and conclude by reporting on consequences of postponed parenthood.

3.1.1 Effects of early parenthood

A substantial amount of research has addressed the issue of motherhood in adolescence and early adulthood. In particular, teenage motherhood in the United States and the United Kingdom has received considerable attention among researchers. Early motherhood has been linked to a number of adverse outcomes. Previous research has suggested that early motherhood is related to poorer mental health outcomes, such as depression (Colletta 1983; Horwitz et al. 1991; Williams et al., 1997; Deal and Holt 1998; Schmidt et al. 2006) and somatic symptom disorder (Troutman and Cutrona 1990). However, Boden and colleagues (2008) showed that the negative mental health outcomes associated with early motherhood largely reflect the influence of family and social background factors that influence early motherhood, rather than the specific effects of early motherhood per se. Previous research has also shown that early motherhood is related to poorer educational outcomes (Klepinger el al. 1995; Lundberga and Plotnick 1995; Hofferth et al. 2001), socioeconomic disadvantage (Furstenberg et al. 1987; Williams et al. 1997), greater risk of economic difficulties (Hobcraft and Kiernan 2001; Olausson et al. 2001; Moffitt 2002), and increased rates of child abuse (Haskett et al. 1994; Woodward and Fergusson 2002). Some studies (Nanchahal et al., 2005) have indicated that the negative effect of

early motherhood on education has decreased during the last decade of the twentieth century, but that a substantial impact still remains.

Research on early fatherhood has not received as much attention as the research on early motherhood. However, like early motherhood, early fatherhood has in most cases been shown to be associated with negative outcomes in adulthood. Teen fatherhood appears to be associated with negative consequences that are similar to those observed for teen mothers (Lerman and Ooms, 1993). Early fatherhood is associated with an increase in the risk of union instability (Manning et al. 2004) and a reduction in young men's ability to invest in education and occupational careers (Manning and Smock 2000). On the other hand, early fatherhood has been suggested to have a positive impact on adult outcomes by getting some young men to settle down (Sampson and Laub 1993).

3.1.2 Effects of postponement of parenthood

The consequence of postponement of childbearing that by far receives the most attention is the increased risk of childlessness or not achieving one's desired family size. However, there are more consequences of postponement of childbearing than the increased risk of childlessness and reduced final family size. Still, most research has concluded that the general knowledge about the possibilities of infertility with increasing age is rather low. Research has shown that young people overestimate the chance of pregnancy at all ages and do not generally identify a woman's age as the strongest risk factor for miscarriage (Bretherick et al. 2010). Other research conducted on Swedish university students has shown that between 25% and 50% of men and women in their 20s are not sufficiently aware of the age-related decline of female fecundity in the late 30s (Lampic et al. 2006; Svanberg et al. 2006). Research has also shown that knowledge about the success rates of different infertility treatment varies between women: 85% of subfertile women expected infertility treatment to overcome the effects of age com-

pared with 77% of the pregnant population. Subfertile women were also, on average, 3.3 years older and more likely to have tried to become pregnant above age 30 years than women in the pregnant population (Maheshwari et al. 2008).

The main results from a recent study by Habbema and colleagues (2015) on the effect of age at first birth on final family size for women in the Netherlands are shown in Table 1. The authors used a simulation model of fertility to calculate the chances of realizing a one-, two-, or three-child family in relation to the female's age when the couple started trying to conceive. Their main findings are not entirely new. Similar results with a linear relationship between maternal age and the risk of childlessness or smaller final family size have been presented before (e.g., Andersson et al. 2009). However, the results of Habbema and colleagues were reported both for couples with access to and willingness to use in vitro fertilization (IVF) and for couples who did not have access to IVF.

Table 1: age of female partner by which couples should start childbearing for a 50, 75, or 90% chance of success to have a one-, two-, or three-child family

Chance of realization	**One-child family**	**Two-child family**	**Three-child family**
Without IVF			
50%	41	38	35
75%	37	34	31
90%	32	27	23
With IVF			
50%	42	39	36
75%	39	35	33
90%	35	31	28

Source: Habbema, J. D. F., Eijkemans, M. J., Leridon, H., and te Velde, E. R. (2015). Realizing a desired family size: when should couples start? *Human Reproduction*, 30(9), 2215-2221.

When IVF is an acceptable option, to have a 90% chance to realize a one-child family, couples should start trying to conceive when the female partner is no older than 35 years. If the couple wants two children, the latest starting age is 31 years, and for three children, 28 years. Without IVF, couples should start no later than age 32 for a one-child family, at 27 years for a two-child family, and at age 23 for three children. If the couple accepts a 75% or lower chance of achieving their desired family size, they can start around 4–11 years later. As already noted, other studies have shown similar results. For instance, Andersson and colleagues (2009) showed that among Swedish women born between 1955 and 1959 who had their first child in their early 20s, the average family size at age 45 is close to 2.5 children. Women who postpone their first childbearing have fewer children on average. Among Swedish women who had their first child in their 40s, the average family size at age 45 is approximately one child. Both studies show that postponement of childbearing is associated with increased risk of childlessness and lower final family size. On the other hand, it is important not to exaggerate the negative impact of age on fecundity. While a majority of people incorrectly believe that the female deadline for childbearing is lower than 40 years of age (Billari et al. 2011), the average 40-year-old woman will still have a more than 50% possibility of spontaneously conceiving a live-birth pregnancy (Eijkemans et al. 2014).

The main explanation for the link between postponement of parenthood and higher rate of involuntary childlessness and smaller families is the increased infertility and fetal death that is associated with higher female (and male) age. The decline in female fecundity—that is, the capacity to bear a child—is primarily explained by a decrease in the number of ovarian follicles and decline in oocyte quality (Broekmans et al. 2007). The decline in female fecundity because of these physical changes seems to be inevitable and irreversible, with no evidence that the process can be slowed (ESHRE 2005).

The advances in modern reproductive medicine have, to some extent, compensated for this natural decrease in fecundity among women (Paulson et al. 2002). However, these treatments are not fully without risk for the health of both the mother (e.g., Kaunitz et al. 1985; Romundstad et al. 2006) and the child (e.g., Ombelet et al. 2006).

An increased risk of fetal death, and in particular spontaneous abortion, with increasing maternal age has been observed in several studies (Risch et al. 1988; Berkowitz et al. 1990; Coste et al. 1991; Fretts et al. 1995; Nybo Andersen et al. 2000). Increasing paternal age is associated with decreasing androgen levels (e.g., testosterone), a deterioration of semen quality, and an increased risk of pregnancy complications and adverse outcomes for offspring (Kühnert and Nieschlag, 2004; de La Rochebrochard et al., 2006; Sartorius and Nieschlag, 2010). Another association between increasing female age and lower fecundity that has been suggested is lifestyle factors such as smoking and obesity, since these effects may accumulate over years of exposure (Augood et al. 1998; Homann et al. 2007; Yilmaz et al. 2009).

Higher maternal age has been shown to be associated with increased risk of chromosomal abnormalities (Cleary-Goldman et al. 2005), premature birth (e.g., Cnattingius et al. 1992), preeclampsia (e.g., Jacobsson et al. 2004), prolonged labor and dystocia (e.g., Main 2000), and low birth weight (e.g., Cleary-Goldman et al. 2005). Another outcome that has received substantial attention is the effect of maternal age on the child's adult health and mortality. However, the results are mixed. Some studies have found little or no evidence for an effect of maternal age on offspring adult health and mortality (Westendorp and Kirkwood 2001; Robine et al. 2003; Hubbard et al. 2009), while other studies have suggested that advanced maternal age is associated with a range of negative adult health outcomes, such as Alzheimer's disease (Rocca et al. 1991), hypertension (Brion et al. 2008), diabetes (Gale 2010), cancer (Hemminki and Kyyrönen 1999; Johnson et al. 2009), and overall mortality (Kemkes-Grottenthaler 2004). Advanced pater-

nal age has also been linked to some negative health outcomes in the child's adulthood. Advanced paternal age has an association with increased risk of autism (Durkin et al. 2008) and schizophrenia (e.g., Malaspina 2001).

On the other hand, previous research has also shown that postponement of childbearing can be beneficial for educational and occupational careers (Härkönen and Bihagen 2011), as well as for parenting qualities (e.g., Martin 2004). Most research on the relationship between maternal age and parenting qualities has shown a linear relationship in which each additional year of life experience is associated with greater parenting qualities, and older mothers have been found to be more emotionally responsive to the needs of their children and also more engaged in constructing cognitively stimulating environments for their offspring (Bornstein et al., 2006; Fergusson and Woodward, 1999; Rafferty et al. 2011; Hofferth, 1987; Ragozin et al. 1982).

It may also be argued that postponement of parenthood may have an indirect positive association on the child because postponement of parenthood increases the probability that the parent has completed his or her higher education (Rindfuss et al. 1996 and Martin 2000). Empirical research has shown that highly educated parents are better able to help their children with schoolwork (Stevenson and Baker 1987, Jimerson et al. 1999) and also better know how to navigate the educational system (Lucas 2001). Researchers have argued that highly educated parents are better at implementing their knowledge into their children's educational lives (Hoover-Dempsey and Sander 1995, Davis-Kean 2005) and that parents' education is positively correlated with the time they spend with their children (Bianchi et al., 2004; Sayer et al., 2004; Guryan et al., 2008). Research has also shown that a higher age at first birth is associated with less anger and frustration during the transition to parenthood (Walter 1986; Mirowsky and Ross 2002). The quality of the mother–child (Ragozin et al. 1982; Conger et al. 1984), father–child (Cooney et al. 1993; Heath 1994), and husband–wife relationships (Helms-Erikson 2001) has been shown to improve with postponed childbearing.

Another positive effect for both the parents and the child is that older parents generally have stronger social support networks (Coleman 1988; Reece 1993). Stein and Susser (2000) argued that the "social advantage" associated with late parenthood may be more important than the biological advantage of early parenthood. Late parenthood might even have a positive effect on health. Mirowsky (2002) reports that early parenthood was associated with long-term negative health of mothers, while delayed parenthood had a positive effect on parents' own health. Another suggestion is that late parenthood might be beneficial from an intergenerational perspective. In many countries, grandparents are very important providers of childcare. Late entry into parenthood increases the likelihood that the grandparents have time to provide childcare (del Boca 2002; Fergusson et al. 2008; Hank and Buber, 2009).

However, results from research on parents at very high ages and their parenting qualities are mixed. Morris (1988) reports that the very highest ages of entry into parenthood are associated with lower parenting qualities caused by decreasing energy at those ages. On the other hand, Finley (1998) argue that there is no association between very high age and parenting quality.

Another potential effect of timing of parenthood may work through the reproduction of inequalities. If potentially disadvantageous family demographic patterns, such as early entry into parenting, are more common among socioeconomically weaker groups while potentially advantageous patterns, such as postponed parenthood and stable family lives, are concentrated in socioeconomically stronger groups, children may experience cumulative (dis)advantages in their living conditions and future life chances (McLanahan and Percheski 2008). On the other hand, the negative effects of postponing parenthood may weaken the intergenerational reproduction of (dis)advantage.

4. Predictors of fertility timing

In this section I will discuss key determinants of fertility, with a specific focus on predictors of fertility timing and on the literature that is most relevant to this dissertation. This section roughly follows the structures of Mills et al. (2011) and Balbo et al. (2013). Both micro- and macro-factors have been suggested to affect childbearing and its timing. At the macro level, the key determinants considered include cultural changes, economic trends, policy measures, spread of birth control, and new reproductive technologies, whereas employment, income, and education are the micro-level predictors that have gained the most interest. I will also discuss how family background and social networks affect fertility. Before this discussion, I will start by discussing the desire to have children and risk factors of teenage parenthood.

The great majority of the population report that they want to have children at some point in life. Among childless Swedes, 89% of cohabitating men aged 20-29 years believed they would become parents at some point in life. The same was true for 87% of Swedish childless, cohabitating women aged 20-27 (Statistics Sweden 2009). The proportion of cohabiting or married women responding "yes" to the question of whether they thought they would ever become mothers was higher among women with a higher education level than among women with lower education (Persson 2009). Two studies from Sweden that investigated the desire for children among university students reported that 90-97% of men and 91-96% of women wanted children in the future. The decision about the timing of parenthood was influenced by having a stable relationship, feeling mature, having completed education, and being employed. Most childless respondents wanted to have 2 or 3 children (Svanberg et al. 2006; Lampic 2006).

Although teenage mother-/fatherhood is influenced by some of the key determinants presented below, there are a number of factors identified as specific risk factors of teenage parenthood. Teenage parenthood can be seen as a special case of accelerated entry into parenthood. The majority of research on teenage pregnancies and teenage parenthood originates from the United States and the United Kingdom, which are the two countries in the Western world with the highest number of teenage births. Sweden (together with Korea, Japan, Switzerland, Italy, and the Netherlands) has the lowest teenage birth rate (below 7 per 1000 teenage girls) (UNICEF 2001).

Evidence from the United Kingdom shows that girls and young women from low-social-class backgrounds have approximately 10 times the risk of becoming teenage mothers compared to girls and young women from the highest social classes (Kiernan 1995). Social class has also been shown to have a strong inverse relationship to risk of teenage parenthood in the US (e.g., Hogan and Kitagawa 1985). Poor average achievement in school is another risk factor of teenage motherhood (e.g., Kiernan 1995; Fergusson and Woodward 2000; Klepinger et al. 1995). Other factors linked to teenage parenthood in these countries are growing up in foster care (e.g., Biehal et al. 1995), being a child of a teenage mother (e.g., Meade 2008), minority ethnicity (e.g., Kenney et al. 1997), and involvement in crime (e.g., Botting et al. 1998). All these factors point to variants of socioeconomic disadvantage as a general risk factor of teenage parenthood.

4.1 Education, employment, and income

Education is among the most often considered variables in fertility research. This research has focused almost exclusive on women's education (Balbo et al. 2013), and this focus also characterizes the discussion below. Educational attendance rates increased throughout the twentieth century. At the end of the century, in most developed countries, educational attendance rates at the secondary level exceeded 85% (UNESCO 2015). Tertiary-level attendance rates expanded during the second half of the twentieth century. In most economically advanced societies, attendance rates at the tertiary level doubled from about 20 to 40% between cohorts born in the 1940s and 1970s (Arum, Gamoran, and Shavit, 2007). Sweden has also followed this development. In Sweden, the fraction of women having a tertiary-level degree by age 30 has more than tripled, and the fraction of men having such degrees doubled between cohorts born in 1948 and 1968 (Högskoleverket 2013).

Much of the theorizing on education and fertility has focused on education as an economic resource. Becker's New Home Economics predicts that female education leads to postponement of childbearing and lower ultimate fertility (e.g., Becker 1981). Becker hypothesized that women with high educational attainment will be more economically independent than women with lower educational attainment. More economically independent women will be less affected by the economic advantages of marriage and therefore more likely to postpone or forego marriage and childbearing. An additional reason why highly educated women would postpone or forego childbearing is that the opportunity costs of childbearing increase with human capital (Becker 1981).

A similar perspective on lower and postponed fertility among highly educated women is that educated women are more likely to have higher career ambitions and postpone childbearing until they are well established in the labor market and have begun their career development (Happel et al. 1984; Becker 1981; Amuedo-Dorantes and Kimmel 2005). On the other hand, once

the educational degree is attained, highly educated women may have higher fertility rates either because they have postponed their fertility until attaining education (Blossfeld and Huinink 1991) or because they are most likely to find partners with high education, increasing the economic foundations of marriage and childbearing (Oppenheimer 1994).

The empirical results are mixed. Early studies generally found a negative association between educational attainment and time of first birth (e.g., Rindfuss et al. 1980; Rindfuss and Craig 1983), and similar findings were also reported later (Liefbroer and Corijn 1999). However, if education level is treated as a time-varying variable, the relationship between education level and the risk of becoming a parent is in most cases positive (Blossfeld and Huinink 1991; Hank 2002), supporting the hypothesis that educated women catch up with childbearing after concluding their studies. Further support for this hypothesis is that educational enrollment has repeatedly been shown to have a strong delaying effect on the timing of transition to parenthood (Blossfeld and Huinink 1991; Kravdal 1994; Rindfuss et al. 1996; Liefbroer and Corijn 1999; Hoem 2000; Andersson 2000; Lappegård and Rønsen 2005), although this effect is somewhat weaker in the Nordic countries compared to other European countries (Billari and Philipov 2004). In Sweden, the negative effect of educational enrolment on childbearing is stronger for younger women (Andersson 2000).

Most studies of higher-order births show a positive impact of woman's education on birth risks once educational enrolment is accounted for (Kravdal 1992; Hoem and Hoem 1989; Hoem 1996; Hoem et al. 2001; Oláh 2003; Lappegård and Rønsen 2005; Kravdal and Rindfuss 2008). Highly educated women are on average older at first birth and therefore have less time than less educated women to have subsequent children. This results in a "time squeeze" (closer spacing of the first and the second child).

Field of education has also been shown to impact fertility. For Norway, Lappegård and Rønsen (2005) reported that women with university degrees

in humanities/aesthetics and the social sciences had relatively low first-birth rates, while the highest first-birth rates were found among women educated as physicians, nurses, healthcare workers, and teachers. The authors argued that a large part of these differences in the first child's risk is probably related to women's labor market situation, as those with lower birth rates also had loser ties to the labor market than women in other occupations. Hoem and colleagues (2006) reported that field of education serves as a better indicator of a woman's reproductive behavior than education level only. Women educated in arts, humanities, or religious occupations have unusually high fractions of permanent childlessness. Using Spanish data, Martín-García and Baizán's (2006) results show that educational field is as important as level of education and that women who pursued academic studies concerned with the care of individuals and/or that emphasize interpersonal skills have the highest first-birth rates. van Bavel (2010) concluded that postponement of first birth is more common among women who studied in male-dominated disciplines and less common among those in more female-dominated fields. However, the causality can also be reversed: more family-oriented women are more likely to choose educational paths that facilitate childbearing and family life (McDonald and Kippen 2009).

The effect of income on fertility has received much attention in economic research. Economic theories (e.g., Becker and Lewis 1973; Becker 1981) on the relationship between income and fertility are generally based on the assumption that individuals' and couples' fertility preferences are fixed, and income and other economic resources affect fertility by helping couples realize these preferences. In a simplistic economic theory of fertility, income should increase the demand for children because financial resources would facilitate childrearing. However, the opposite prediction of negative relationship between income and fertility is more common. One explanation for this negative association is that decisions about fertility are affected by a quantity–quality tradeoff. The effect of income on fertility is the balance between

the quantity and the quality of children. Because siblings share their parents' time and resources, having fewer siblings implies that each child will receive a larger share of the household resources. Furthermore, according to these theories, high-income earners are more likely to favor quality above quantity, further strengthening the negative association between income and fertility (Becker and Lewis 1973). Another suggestion by Becker (1981) is that the main motivation for family formation is increased wellbeing and efficiency gains due to task specialization among married couples. As a result, the incentive to marry (and have children) will decrease as men's and women's human capital become more similar. Furthermore, the opportunity cost of childbearing—due to the higher short-term and long-term costs of being absent from work—is higher for high-income women than for low-income women.

The long-term earnings cost of childbearing is often referred to as the motherhood wage penalty (Budig and Englad 2001). The size of motherhood penalty varies across countries and depends on how the penalty is defined. The unadjusted motherhood penalty for all parities is usually estimated to be between 5% and 60%. For Sweden, the unadjusted motherhood penalty is estimated to be approximately 24% (e.g., Budig et al. 2012: 176). However, most cross-national studies of the Nordic countries have reported small motherhood wage penalties (Petersen et al. 2010).

The opportunity costs of childbearing and the motherhood wage penalty also predict a negative association between women's labor force participation and childbearing. These effects are generally stronger when unharmonious demands between work life and family roles make participation in both roles more difficult (Greenhaus and Beutell 1985; Brewster and Rindfuss 2000), and they can be particularly strong for highly educated women and women in professional occupations for whom childbearing would obstruct career building (e.g., Halldén et al., forthcoming).

4.2 Family background and fertility

The effect of family of origin on various outcomes in adulthood has been studied extensively in sociology and the other social sciences. The clearest example is stratification research, in which this type of focus is a major aspect of the field. This research has highlighted that related measures of the family of origin are not necessarily interchangeable. It has also stressed the need to control for core mediating pathways—especially education—for distinguishing between indirect and direct effects of family background. The second study in this thesis aims to fulfill both of these requirements.

In the following section I will discuss research on the effects of family background on fertility. I start by outlining the intergenerational relationship between number of siblings and own fertility and some of its explanations. I then move on to other aspects of family background, with an emphasis on the effect of class of origin and of social mobility.

The association between parents' and their children's fertility has been a subject of continuing scientific interest since the end of the nineteenth century (for an excellent review of nearly one hundred years of research, see Murphy 1999). Most studies have found a weak yet persistent parent–offspring correlation in completed family size, generally ranging between 0.10 and 0.15 (Berent 1953; Katner and Kiser 1954; Duncan et al. 1965; Johnson and Stokes 1976; Thornton 1980; Zimmer and Fulton 1980; Anderton et al. 1987; Axinn et al. 1994, Hardy et al. 1998; Murphy and Wang 2001; Murphy and Knudsen 2002). A major difference in studies conducted around the end of the nineteenth century and studies performed later is that the earliest studies emphasized biological heredity as the main explanation for the correlation between the number of siblings and own final family size, while more recent studies tend to explain the correlations with socialization and the intergenerational transmission of fertility preferences. In one of the earliest studies, by Pearson and colleagues (1899), genetic interpretations were almost exclusively used to explain the correlation in family size across

generations. One of the first studies to emphasize nurture rather than nature when explaining the intergenerational correlation of family size was done by Huestis and Maxwell (1932), who introduced inherited desire as the main explanation.

Another type of intergenerational fertility research focused on the correlation of age at entering parenthood for successive generations. Researchers have had a particular interest in the intergenerational transmission of teenage motherhood, and most of these studies have shown that daughters of teenage mothers have an elevated probability of becoming teenage mothers themselves. The teenage birth rate of daughters of teenage mothers has in most cases been estimated to be around 1.5 times as high as that of daughters of women who were not teenagers at first birth (Furstenberg et al. 1990; Kahn and Anderson 1992; Manlove 1997; Barber 2001; Stanfors and Scott 2013).

Despite the great interest in the intergenerational transmission of fertility, surprisingly little research has been done beyond studying the correlation in fertility between parents and offspring. With the exception of studies of the inheritance of teenage motherhood, the mechanisms that explain weak but consistent correlations between parents and their children's family size and timing of becoming a parent are somewhat poorly investigated. However, some researchers have explained parts of the black box of intergenerational transmission of fertility with education (e.g., Bernhardt 1989; Lappegård and Rønsen 2005) and other socioeconomic characteristics (e.g., Bernhardt 1989; Barber 2001; Kolk 2014), genetic heritability (e.g., Kohler et al. 1999; Rodgers et al. 2001), and socialization (e.g., Anderton et al. 1987; Kolk 2014).

The most frequently used explanation for why parents' and children's fertility are positively correlated is the intergenerational transmission of values and behavior. The basic assumption is that children adopt their parents' preferences, desires, and norms toward family size (and age of entry into parenthood) during socialization. Thus, children from large families are

more likely to desire and plan to have more children than children from smaller families (Duncan et al. 1965). Earlier studies have documented a correlation between parents' behavior and children's preferences (Hendershot 1969; McAllister et al. 1974; Marshall and Cosby 1977; Stolzenberg and Waite 1977; Thornton 1980). Furthermore, not only what parents do, but also the preferences they express has been shown to matter in shaping their children's attitudes (Gecas and Seff 1990) and behavior (Axinn and Thornton 1992; 1993). Children whose mothers prefer early family formation and large families become parents at a younger age than their peers (Barber 2000).

Fecundity can be transmitted through heritable genetic factors. The genes inherited from the first generation can influence the timing of becoming a parent for the second generation. If the parents had difficulty conceiving and therefore became parents later than planned, their children may also be more likely to enter parenthood later due low fecundity. While the standard demographic explanation stresses the role of socialization and early environment, researchers using twin designs have argued that fertility to some extent is affected by heritable genetic factors (Kohler et al. 1999; Rodgers et al. 2001; Kirk et al. 2001). Using general population samples, Rodgers and Doughty (2000) suggested that both fertility expectations and desires have a heritable component. These studies have focused on the genetic heritability of fertility preferences and not on the heritability of fecundity. Using a twin sample of Australian women, Kirk and colleagues (2001) estimated that around 40% of the variance in fecundity can be attributed to genes. Another possibility is that genetic heritability of other characteristics that are also associated with fertility, such as health, appearance, IQ, or SES, could explain the genetic heritability of fertility. Kosova et al. (2010) found that significant heritability of reproductive traits in both men and women remained after accounting for common household effects shared by siblings.

Another approach to the study of family of origin and fertility has been to investigate the relationship between class of origin and fertility. Most of this research has studied the relationship between social mobility—that is, moving from one class of origin to another class of destination—and fertility rather than the direct effects of family of origin. This field of research has a tradition of more than a century. One of the earliest writers on the relationship between social mobility and fertility was Arsène Dumont (Kasarda et al. 1986), who argued that small family size was favorable for upward social mobility. According to Dumont, individuals have a natural desire to climb the social ladder and in this desire become less likely to have children. Not only the encouragement of upward mobility, but also the threat of downward mobility provoked fertility limitation (Kasarda et al. 1986). Another early writer on the relationship between social mobility and fertility was Francis Galton (1900), who was one of the first to describe the lower fertility among higher classes. Galton explained low fertility among higher classes by describing that heiresses with lower fertility generally have larger heritage due to fewer siblings, which made them more attractive in the marriage market. Cobb (1913) and later Fisher (1930) developed Galton's theory to a more general theory valid not only to the low fertility among higher classes but also to every level of society. Fisher argued in particular that selection of the infertile was a major cause of an inverse relationship between social class and fertility. Another early writer on the inverse relationship of population size with individual and societal development was the German sociologist von Ungern-Sternberg (1931), who concluded that the never-ending competition for social rank within a capitalist system led to a new ruling mentality that encouraged individualism and led bourgeois men to believe that having few or no children was good for winning the socioeconomic race. Unfortunately, several of these writers not only tried to explain the relationship between social mobility and fertility, but also developed their theories to support eugenics.

At the same time as the first theories on the relationship between social mobility and fertility were formulated by eugenicists, the earliest birth-control movements were developing in many countries, which had the fight against poverty as their main motivation for spreading the knowledge of birth control. Most of the early writers advocating the spread of birth control agreed with the eugenicists that higher classes had lower birth rates but explained this by widespread use of birth control among the highly educated. In 1917 Charles Vickery Drysdale writes "statistics go to show that limitation of families is practically universal among educated married persons at the present day, and that this is due to artificial restriction rather than to moral restriction" (Drysdale 1917: 125).

In line with Dumont, most studies in the 1940s and 1950s explained the inverse relationship between class and fertility by positing that rational agents limited their family size in their quest to be socially upwardly mobile. Westoff (1953) and Perrucci (1967) argued that rational individuals in their struggle to move up the social ladder will be motivated to enter marriage later and reduce their family size. Baltzell (1953) and Tien (1965) put forward similar explanations, but without explicitly attributing the behavior to rational individuals. Baltzell concluded that reduced family size is an economic necessity for individuals who want to move up, and upwardly mobile individuals are inclined to adopt the higher classes' norms of smaller families. Tien argued that female labor force participation is an economic necessity for upwardly mobile couples that causes postponement of childbearing.

Burks (1941) was one of the first to compare the fertility of social mobile couples not only to that of non-mobile couples at the class of destination but also to that of non-mobile couples in the class of origin. Burks concluded that the fertility of mobile couples lies between the fertility of non-mobile couples in the origin and destination classes. Burks argued that mobile individuals carry with them the childbearing behaviors of their class of origin, but they are also affected by the fertility behaviors in the class of destination.

Berent (1952) extended the analysis by including downwardly mobile individuals in the analysis, confirming the results of Burks that mobile individuals' fertility is intermediate between their classes of origin and destination. However, his main contribution was to question a causal relationship between social mobility and fertility. The eugenics movement had argued that fertility affected mobility, whereas around the time of Berent's work, the prevailing view was instead that social mobility affects fertility. Berent emphasized that the findings that mobile couples' fertility is intermediate between the fertility of the class of origin and that of the class of destination do not tell whether social mobility is the effect of family size or intermediate fertility is caused by the combination of socialization into the class of origin and adopting of fertility behavior within the class of destination. Blau (1956), Duncan (1966), and Blau and Duncan (1967) made similar arguments.

A highly important contribution to the research on the relationship between social mobility and fertility was presented by Bean and Swicegood (1979), who established four main theoretical explanations of the effect of social mobility on fertility. The social isolation perspective predicts that mobile individuals will have higher fertility than the non-mobile because mobile individuals lack social support in their new class and partly compensate for this by having children (Ellis and Lane 1963, Hoffman and Wyatt 1960). The stress and disorientation explanation predicts mobile individuals to have lower fertility than the non-mobile because mobile individuals will experience their lives in the new class as stressful and norm-less and therefore will not desire to have children (Blau 1956). According to the status enhancement theory, the desire to improve one's social status is an important motive for restricting family size. Downwardly mobile individuals are likely to have higher fertility because they choose to invest their resources in children (Westoff 1953). Finally, according the relative economic status perspective, the birth rate does not necessarily respond to the absolute level of

economic wellbeing but rather to levels relative to those to which one is accustomed. Individuals who have improved their income as adults compared to their childhood levels enter parenthood early and have several children. Individuals who have a lower income in adulthood compared to their childhood level will be less likely to enter parenthood early (Easterlin 1975).

4.3 Social networks

Social relationships other than the parent–child relationship have also been suggested to affect fertility. One example that has already been mentioned is the grandparental role as caregiver. In many countries grandparents are an important resource in childcare (del Boca 2002; Fergusson et al. 2008; Hank and Buber 2009). Circumstances in the grandparents' life that affect the grandparents; opportunity to provide childcare can thus affect their children's fertility decisions. The grandparents' stage of life and their resources may affect their children's decision to accelerate or postpone childbearing. Hank and Kreyenfeld (2003) and Del Boca (2002) report that the availability of informal childcare through the child's grandparents increases the likelihood of childbearing.

Another relationship that has received attention is the sibling relationship and its possible effect on fertility timing. When siblings or friends are shown to affect each other's fertility, it is often called the contagious effect of fertility. Kuziemko (2006) and Lyngstad and Prskawetz (2010) reported that a sibling's recent childbearing has a strong positive effect on first-birth rates. In the special case of teenage parenthood, one study by Monstad and colleagues (2011) showed that within families, teen births tend to be contagious, and the effect is larger when siblings are close in age and for women from low-resource households. However, a study by Kotte and Volker (2011) find no evidence of such a sibling effect Also a study on the possible contagious effects of teenage parenthood suggest that a friend's teen birth is

associated with a reduction in the likelihood of own teen childbearing (Yakusheva and Fletcher 2015).

Research has also reported contagious effects among neighbors (Bloom et al. 2008), co-workers (Ciliberto et al. 2010; Hensvik and Nilsson 2010), and friends (Balboa and Barban 2014). However, co-workers, friends, and siblings tend to be similar, and therefore similarities in fertility behavior may be driven by common unobservable characteristics rather than social network effects (Manski 1995).

4.4 Birth control and reproductive technology

The most significant macro-level factors that have been argued to affect fertility are "the contraceptive revolution," developments in assisted reproductive technology, economic trends, policy changes, and changes in values and attitudes. Despite the central importance of modern contraception in explaining the decline of fertility in human history, fertility rates started to decline in industrialized countries even before effective methods of contraception had become readily available, illustrating that motivated couples to some extent were able to control their fertility at a measurable level even with less effective contraception methods. Nonetheless, the largest declines in birth rates occurred after effective methods of contraception became relatively cheap, simple, and easily accessible (Westoff and Ryder 1977). Even as modern methods of contraception made it easier for couples to control and plan their births, changing attitudes toward family planning have contributed to this major decline in fertility. Changing attitudes about the appropriate age to become a parent (Billari et al. 2011) and individual autonomy and self-realization (Surkyn and Lesthaeghe 2004) are two changes in attitudes that are often expressed as driving forces behind the postponement of childbearing. Another important effect of the introduction of effective contraception—especially the pill—was that it shifted the decision-making element of

childbearing, giving women increasing power over both the timing of childbearing and final family size (Katz and Goldin 2000).

The counterparty of the contraceptive revolution can perhaps be said to be the remarkable technological development of assisted reproductive technology (ART), which can help couples who otherwise have difficulties conceiving to have children. Depending on differences in definitions and variations between countries and continents, the estimated worldwide prevalence of infertility ranges between 4% and 14% with a consensus estimate of roughly 10% of couples (Thonneau and Spira 1990; Greenhall and Vessey 1990; Larsen 2005). In some societies—particularly countries in the "infertility belt" of central and southern Africa—as many as one-third of couples are unable to conceive (Secondary infertility) (Larsen 1994; Ericksen and Brunette, 1996). The development of ART and cryopreservation methods has increased the chance of becoming a parent for both men and women facing fertility problems. Some researchers have argued that the first successful human in vitro fertilization (IVF) in 1978 created a new era "after IVF" (Franklin 2012). The technological achievements of ART started much later than effective contraceptives became widespread. The magnitude of the impact of ART on aggregated fertility rates is not the same as the spread of effective contraception. However, from when Louise Brown, the first "test-tube" baby, was born in 1978 to when she became a mother herself (a naturally conceived boy) in 2006, more than 3 million babies have been brought into the world with help from ART (Lancet 2006). In 2012, the number of children that had been born with help from ART was nearly 5 million worldwide (Franklin 2012).

IVF has become the standard treatment for female infertility (Franklin 2012), and intracellular injection of sperm (ICSI) (injection of the sperm into the egg) has become the standard for infertility of the male partner (Neri et al. 2004). Moderated by the age of the woman, the underlying reasons for

her infertility, and the types of ART procedures used, approximately 30% of all ART cycles end in a live birth (Wright et al. 2004).

Both the availability and the use of ART vary considerably between countries. The most obvious difference in access to ART is between developed and developing countries (Nachtigall 2006). Efficient ARTs and infertility treatments are generally inaccessible in the poorest and most rural nations, leading to untreated infertility across large parts of the non-Western world (Nahar et al. 2000; Richards 2002). In countries with high-quality data on the use of ART treatments, the rates of ART varied between 14 treatment cycles per million population in Ecuador and 3,844 per million population in Israel (Sullivan et al. 2013). All Nordic countries rank high in the proportion of children born after ART treatments. In Denmark, with relatively generous access to fertility treatments, the share of infants born after ART comprised 6.2% of all newborns in 2002 (Nyboe Andersen and Erb 2006).

Two concerns regarding ART treatments have received substantial attention. First, researchers have argued that ART treatments can have negative health effects for both the mother (e.g., Burkman 2003) and the child (e.g., Seamark and Robinson 1995; Boerjan et al. 2000). However, other researchers have argued that no such risks exist (e.g., Lerner-Geva et al. 2003; Klip et al. 2000). Second, one unintended consequence of ART is the increased risk of multiple births. There are significant regional differences in the way ART is used. In North and Latin America and Asia, around 40% of all transfers include four embryos, while in Europe this happens in less than 5% of cases. In Sweden, the most common type of transfer (70% of all cases) involves just one embryo (Lancet 2006).

Improvements of obstetric intervention have received less attention in fertility research, although they can affect fertility at the individual and societal levels alike. Pregnancy has always carried a risk to the mother's life. In all Western countries maternal mortality—the death of women during pregnancy, childbirth, or in the 42 days after delivery—has declined remarkably in

the twentieth century. In Sweden, which has the best continuous data on mortality, maternal mortality plummeted from 900 deaths per 100,000 live births in 1750 (Högberg and Wall 1986) to only 5 deaths per 100,000 in 2008 (Hogan et al. 2010). The main explanation for this remarkable decline in maternal mortality is often attributed the emergence of modern medicine, developments in public health policy, and transfer of knowledge and work tasks to midwives (Högberg and Wall 1986; Högberg et al. 1986; Högberg 2004). Stillbirths and infant mortality have also declined dramatically over the past hundred years. In 1900, infant mortality in Sweden was approximately 100 per 1,000 births (Corsini and Viazzo 1993). Today, only two war-torn countries (Afghanistan and Mali) exceed this rate. In 2015, infant mortality in Sweden was down to 2.2 per 1,000 births (2015 World Population Data Sheet).

Obstetric care has undergone major changes during the 1900s. Developments in training of midwives, induction of technology, and general improvement and increased accessibility to public health care have all contributed to increasing the safety for both mother and child during pregnancy and delivery. Instrumental deliveries have been a part of general obstetrical practice for more than a century, and cesarean sections became safe enough in the second half of the twentieth century to be widely used (Drife 2002). Some researchers have questioned the (over-)use of instrumental and cesarean delivery. Even if cesarean section is undoubtedly a benefit in selected high-risk pregnancies, the (increased) use of cesarean section on healthy women and infants is problematic. Cesarean section has been argued to increase the risk of asthma and other illnesses because the newborn is not exposed to different gut bacteria when it is not delivered vaginally (Grönlund et al. 1999; Renz-Polster et al. 2005). Some researchers have suggested that difficult instrumental delivery may lead to psychological sequelae that may result in a decision not to have more children (Gottvall and Waldenström 2002; Hildingsson et al. 2011; Wiklund et al. 2008).

There are relatively large cross-national differences in the use of different modes of delivery. The Nordic counties maintain relatively low rates of cesarean section (below 20%), whereas in the United States nearly 30% of babies are delivered by cesarean section (Martin et al. 2007) and in Latin America the proportion is above 50% (Villar et al. 2006). Countries with high rates of cesarean section usually have low levels of vacuum extraction deliveries. In 2008, the rate of vacuum extraction in Sweden was 9.5% (Socialstyrelsen 2016), while the proportion in the United States was 3.2% (Martin et al. 2012).

4.5 Fertility norms, value and attitudes

The theory of the second demographic transition (SDT) has become the leading framework for describing the importance of ideational change for demographic change (van de Kaa 1987; Surkyn and Lesthaeghe 2004; Lesthaeghe 2010). The assumption is that increased personal freedom—especially among women—has changed the sequencing of growing up, marrying, and having children by increasing the rates of single living, cohabitation, and quests for self-realization. Increased acceptance of separation and marriage dissolution is likewise seen as part of the second demographic transition. The driving force behind this development is above all the ideational change toward more individualistic and secular values. One important assumption is that a majority of people in Western societies achieved an economic standard of living during the second half of the twentieth century that made it possible to esteem other values more than traditional family values. The main idea is that when basic needs are met, individuals can start focusing on higher-order needs, such as self-realization. Because children require time and economical resources, self-realization will easily conflict with parenthood and therefore its pursuit increases the tendency to postpone childbearing (Lesthaeghe 2010).

Some trends in childbirth, marriage, and other family demographic behaviors can be seen as empirical support of a second demographic transition. As already mentioned, in almost all developed countries a postponement toward higher ages at first birth started during the last three decades of the twentieth century. Bernhardt and Goldscheider (2006) showed a postponing effect of increased autonomy and independence on fertility in Sweden, and Liefbroer (2005) showed similar results for the Netherlands. Some early studies showed that female labor force participation was linked to lower fertility (Bernhardt 1993; Brewster and Rindfuss 2000), delayed marriage and cohabitation (Espenshade 1985), and increased union dissolution (Ruggles 1997). Also marriages have on average been postponed in most developed countries (Lesthaeghe and Neidert 2006; Lesthaeghe 2010). Research on marriage and cohabitation has shown that cohabitation as a prelude to marriage and cohabitation instead of marriage have increased in many countries (Heuveline and Timberlake 2004; Hiekel et al. 2014). The portion of children born to non-married cohabiting parents has also increased in many Western societies (Perelli-Harris et al. 2012; Heuveline and Timberlake 2004). Both of these developments have been observed in the Nordic countries.

Both the theory of the Second Demographic Transition and Becker's New Home Economics, discussed above, predict a long-term development toward fewer children and marriages and greater instability of couples. Based on different assumptions, both theories assume that increased self-realization and women's autonomy are negatively correlated with fertility and married stability. However, recent studies do not find support for the assumption that fertility is negatively correlated with economic development, self-realization, or gender equality (Bracher and Santow 1998, Andersson 2000; Myrskylä et al. 2009), and in some cases there even seems to be a positive correlation (Ahn and Mira 2002; Sleebos 2003; Billari and Kohler 2004).

A second reason to challenge both Becker's New Home Economics and the theory of the second demographic transition is that the negative associa-

tion between educational attainment and fertility and union stability no longer appears valid. Even if fewer children, cohabitation, and divorces initially were more adopted by highly educated women, more recent data indicate a shift toward a reverse or U-shaped relationship. Recent research has shown an inverse relationship between educational attainment and union dissolution in many European countries (Blossfeld et al. 1995; Bernardi and Martínez-Pastor 2011; Salvini and Vignoli 2011; Matysiak et al. 2014), and this development is particularly clear in the Nordic countries (Hoem 1997; Lyngstad 2004; Härkönen and Dronkers 2006; Matysiak et al. 2014).

Finally, a third empirical finding that does not support the New Home Economics or the theory of the SDT is the evidence that there has been no or very little change in people's preferences regarding marriage, parenting, family size, adultery, and sexuality (Scott and Braun 2006; Sobotka and Beaujouan 2014).

These three pieces of recent evidence raise doubts about the validity of the second demographic transition and New Home Economics perspectives for explaining trends in fertility and other family behaviors. With these findings as their starting point, two recently published articles (Goldscheider et al. 2015; Esping-Andersen and Billari 2015) have instead emphasized and argued for the gender revolution as the driving force behind the development in family demographic behavior. Previous studies have emphasized a similar relationship. Goldscheider (2000), McDonald (2000), and Bernhardt (2004) all emphasize the role of gender equality as the main force when explaining the family demographic change that has occurred. Goldscheider and colleagues (2015) and Esping-Andersen and Billari (2015) present theoretical frameworks that help explain both the phase of marital and fertility decline and the subsequent recovery. Both articles argue that female labor force participation and women's increased educational attainment initially may have decreased fertility and union formation and increased union disruption due to the double burden for women when labor force participation and responsibil-

ity for housework and childcare are combined. The burdens of both labor force participation and responsibility for housework and childcare may reduce the willingness to get married and have children. However, if/when men start to take on a larger share of the responsibility for housework and childcare, the gender revolution could lead to increased fertility and decreased union disruption. The assumption is that if men and women share both paid work and housework/childcare equally, it will lead to an increased willingness to commit between partners and therefore more stable unions with perhaps higher fertility. Also, Kohler (2001) criticized the economic approach to studying fertility by arguing that the economic theories have neglected social and institutional context as well as cultural factors and that they have overestimated the importance of rationality.

4.6 Economic trends

One of the most frequently tested relationships at the macro level is a possible relationship between economic trends and fertility, for which both pro- and counter-cyclical relationships have been suggested. Different indicators of economic trends, such as changes in GDP and unemployment rates, have been used to study a potential association between macro-level economy and fertility. Perhaps the most common theoretical assumption is that fertility responds positively to economic prosperity and negatively to economic crisis. In particular, economic crisis has been described as causing postponement of first births (Sobotka et al. 2011). The explanation for why economic crisis would lead to postponement of childbearing is usually that an economic crisis leads to increased uncertainty about future earnings, which in turn leads to reduction of couples' willingness to have children (Easterlin 1976; Mills and Blossfeld 2005). Some studies have provided empirical support to the suggestion that uncertainty affects fertility negatively in both historical societies (Kiser and Whelpton 1953; Lynch 1986; Friedlander 1992) and

contemporary ones (Witte and Wagner 1995; Huinink and Kreyenfeld 2004). However, this impact of uncertainty on fertility can be affected by the configuration of the welfare state (Blossfeld et al. 2006) as well as moderated by women's educational attainment (Kreyenfeld 2010).

Overall, the assumption of a pro-cyclical relationship between economic trends and fertility has been shown to have empirical support in both historical society (e.g., Tzanatos and Simons 1989; Lee 1990; Bengtsson et al. 2004) and contemporary society (e.g., Santow and Bracher 2001; Martin 2004; Sobotka et al. 2011). For Sweden, Andersson (2000) showed evidence of a pro-cyclical relationship between economic trends and fertility that to some extent can be explained by women's income and education enrollment. A rise in the number of women with lower earnings and enrolled in education can explain part of the decrease in fertility during economic crises. Other researchers have theorized that the relationship between economic trends and fertility could be counter-cyclical because the relative cost for women to be out of the labor market is lower during economic downturns than during economic crises (Butz and Ward 1979). This assumption has been shown to have some empirical support (e.g., Butz and Ward 1979; Billingsley 2010), indicating that the relationship between economic trends and fertility is ambiguous and depends on social and policy context.

4.7 Social Policies

The configuration of the welfare state influences how easy or difficult it is to combine work and education with family life. The type of welfare state may also affect how unemployment, sickness, or other dramatic events affect family life and thereby affect individuals' propensity to accelerate or postpone childbearing (Hoem et al. 2006). In some cases the focus has been on the effects of different welfare regimes, and typically de-familialized societies like the Nordic countries (where the government takes major responsibility for individual welfare) has been associated with higher fertility (e.g., Andersson 2004).

Mills and colleagues (2011) listed three main types of social policy incentives that can increase fertility: direct cash payments, indirect transfers, and policies to improve work–family compatibility. Empirical research on the effect of direct cash payments, such as baby bonuses or family allowances, on fertility rates typically shows positive but weak association between the two. Analyzing data from 22 industrialized countries, across the years 1970–1990, Gauthier and Hatzius (1997) showed that even if the magnitude is limited, cash benefits in the form of family allowances are positively related to fertility. For Sweden, Walker's (1995) results showed that child allowances had a small positive impact on fertility rates during the 1970s, and Björklund (2006), using data on the Swedish birth cohorts of 1917–1958, indicated that direct cash transfers have had a positive impact on birth rates. Research on more recent data from Israel (Cohen et al. 2007) and Canada (Milligan 2005) have shown positive and significant effects of the implementation of baby bonuses on childbearing. The empirical support for a positive effect of indirect transfers, usually tax exemptions, on fertility are in most cases weak or nonexistent (Whittington et al. 1990; Georgellis and Wall 1992; Brouillette et al. 1993; Zhang et al., 1994; Kearny 2004; Gauthier 2007).

The third set of social policy incentives that Mills and colleagues emphasized are policies aimed at supporting the combination of work and childrearing. Most studies find that both access to childcare (e.g., Castles 2003; Oláh 2003 Rindfuss et al. 2010) and parental leave (e.g., Hoem 1993) are positively correlated with fertility. Most empirical studies show evidence of a positive association between subsidized childcare (Vikat 2004) or generous parental leave systems (Hoem 1993; Lalive and Zweimuller 2005; Zabel 2009) and fertility. Fathers' use of parental leave has also been shown to be positively correlated with couples' subsequent fertility (Olah 2003; Duvander and Andersson 2006; Duvander et al. 2010). Neyer and Andersson (2008) discussed three important issues regarding measuring the effect of social policies on fertility. First, the large variety of policy interventions makes it difficult to isolate the effect of a specific policy. Second, the time lag between the implementation of policies and any effects on fertility makes it harder to detect any causal effects. Third, it is difficult to determine whether change in fertility rates is due to policy changes or if the policy is a reaction to fertility and society's desire for policies.

5. Data

The empirical analyses have been performed based on data from Swedish population registers. The register data used for Studies I, II, and IV were drawn from a collection of registers called Sweden in Time: Activities and Relations (STAR), which are organized by Stockholm University, stored by Statistics Sweden, and accessed through remote desktop. The Swedish Medical Birth Register (MBR) used for Study III is kept by the Swedish National Board of Health and Welfare. In the following section I will present these two data sources.

The main characteristic of demographic research is that "time under risk" is included as the denominator in statistical analyses. For this type of research longitudinal data are needed. The Swedish population registers are an excellent source for demographic research. The registers cover the whole Swedish population and its vital events with a very high degree of accuracy. Administrative register data are not only an excellent source for demographic analysis; they are also partly the product of demographic work. Sweden has a long history of keeping national administrative registers. The Swedish church started to keep local registers of parish members in 1686, and national population statistics began to be gathered in 1749. This enabled the Swedish state to keep track of its population, for instance to enroll soldiers in the army. The modern Swedish population registers started with the introduction of a unique personal identity number in 1947 (Statistics Sweden 2012).

The Swedish population register provides unbiased and accurate measurements of demographic events such as births, deaths, migration, and civil status changes. In addition to these core demographic events, the administrative registers also contain a large number of socioeconomic variables (e.g.,

taxable earnings and wealth, unemployment benefits, educational histories) and other variables (e.g., conscription data, causes of death). Census data, collected in five- or ten-year intervals until 1990, make it possible to create additional variables on occupation, cohabitation, and housing conditions for selected years.

Essential for this dissertation is that the data allow me to link individuals to their children, parents, and siblings. The Total Population Register contains information on parents and their children. Two or more individuals having the same parents are thus siblings. Using the information on parent and children linkages, it is possible to create a multi-generation register. The Swedish multi-generation register contains information on those who were born in 1932 or later and who were ever registered as living in Sweden at any time since 1961. Swedish registers contain information on most individuals' biological and/or adoptive parents. There are currently about 15 million individuals in the Total Population Register and roughly 9 million are linked to their biological and/or adoptive parents. The number of individuals with information on biological parents differs between Swedish-born and foreign-born persons as well as by birth cohort. Among individuals born in Sweden, 98% of biological mothers and 95% of biological fathers are identified. Among Swedish-born individuals born after 1949, these shares are even higher (100% of biological mothers and 98% of biological fathers). However, among foreign-born individuals, the share of biological parents identified is substantially lower: only 27% of biological mothers and 22% of biological fathers are identified in the registers.

The Swedish administrative registers provide demographers with a unique opportunity to study intergenerational and social network influences on fertility. The research design of intergenerational fertility research puts extra demands on data because of the requirement to link individuals to both their parents and their own childbearing. In order to study intergenerational influences on fertility, the data must not only identify a sufficient fraction of par-

ents. All individuals must also have lived long enough to be exposed to the risk of becoming a parent and to be followed up to the end of their reproductive age. Study II offers an example. In order to analyze the impact of parental class on permanent childlessness, the study could not include cohorts born before 1940 because the share of individuals with information on parents was not sufficiently high among older cohorts. Cohorts born after 1963 (1958 for men) could not be included in the study either, because individuals born later would not have lived long enough to be followed until the end of reproductive age.

Study III uses The Swedish Medical Birth Register (MBR), which is maintained by the Swedish National Board of Health and Welfare. The MBR was established in 1973 by an act of the Swedish parliament with the purpose to collect information on antenatal (occurring before birth) and perinatal (occurring after birth) factors and their importance for the health of infants and mothers. The register includes information on smoking habits, infertility problems, height, weight, reproductive and obstetric history, medications, and other relevant factors. Information is collected during pregnancy, delivery, and the neonatal period, until the mother and infant are discharged from hospital. Obstetric information (e.g., mode of delivery, complications during delivery) and information on the infant (single or multiple birth, birth weight, gestational age, Apgar score, sex, and infant diagnoses) are part of the MBR. The register includes all live births from the 22nd gestational week and stillbirths. The MBR is an exceptionally rich population-based data source. The numbers of missing values are very low. The MBR is compared every year to the output of infants reported to the Birth Register at Statistics Sweden, and missing cases that are discovered are included by obtaining copies of medical records from the hospitals involved. As a result, only 1.4% of all infants born in Sweden are not recorded in the register (Källén and Källén 2003). The MBR has been evaluated three times: in 1976, 1988, and 2001. Even when small errors were discovered, the general verdict

of all three evaluations was that these errors were well within reasonable limits and that the overall quality of MBR was very high (Cnattingius et al. 1990).

6. Summary of empirical studies

Study I—Family influence in fertility: A longitudinal analysis of sibling correlations in first birth risk and completed fertility among Swedish men and women

Published in *Demographic Research*

Both the social sciences and medical research have repeatedly shown that one's family of origin matters for various outcomes in adulthood. In demography, family of origin has been shown to affect outcomes such as family formation, partner selection, marital disruption, male participation in household work, and even mortality. As shown in the research review, family of origin has been repeatedly shown to affect the offspring's fertility behaviors. In the first study, the aim was to estimate and describe the overall impact of family of origin on the timing of entry into parenthood and on final family size. This was done by estimating brother and sister correlations in first birth risk and in final family size, for birth cohorts born from 1940 to 1963 (1940 to 1958 for men), using multi-level event history and multi-level linear regressions.

The results can be summarized by three main findings: 1) the overall variation in fertility that can be explained by family of origin is approximately 10%–15% for men and 15%–25% for women; 2) the overall importance of the family of origin did not change over the approximately twenty birth cohorts that were studied; and 3) parents' completed fertility accounted for only a small share of the total family background effect on completed fertility.

These results have two important implications for future research on the effects of family of origin on the offspring's fertility. Showing that a non-negligible proportion of the variation in fertility can be attributed to family of origin and that only a small part of the variation can be explained by the number of siblings provides a strong rationale for further investigating how family background affects fertility behaviors. Furthermore, the finding that the overall importance of family of origin did not change over the twenty birth cohorts studied provides some support that the results in the second study are valid beyond the studied cohort.

Study II—Social Background and Becoming a Parent in Sweden: A Register-Based Study of the Effect of Social Background on Childbearing in Sweden

Published in *European Journal of Population*

In contrast to the first study, in which I included more than twenty birth cohorts and their siblings, I only studied one birth cohort in the second study to examine the impact of social background on the timing of the first child and the final probability of becoming a parent. I included more information, both on the family of origin and on factors that potentially mediate the relationship between family background and fertility. I only studied one birth cohort to optimize the use of the Swedish data registers. Including younger cohorts would not have given me the same opportunity to study the effect of social background on the probability of childlessness. Including older cohorts had particularly weakened the quality of the information on educational histories, but also made the information on parents' education, income, and occupation less reliable.

I included three measures of social background—occupational class, social status, and parental education—when applying event history and logistic

regressions to analyze the effect of social background on the timing and probability of becoming a parent. I also included information on the most important pathways between each dimension of social background and the offspring's fertility.

The principal finding is that social background has a net effect on the timing of becoming a parent, even when controlling for the index person's own educational history, mother's age at first birth, and father's mean income. The results show that each of the three dimensions of social background has a clear bivariate association with the risk of becoming a parent, both for men and for women. Parental education turned out to matter the most when all dimensions of social background were included simultaneously. The results show that higher social background is associated with postponed childbearing but does not affect the final probability of ever becoming a parent. The net effect of social background on fertility is stronger for women than for men.

Study III—Mode of delivery and the probability of subsequent childbearing: a population-based register study

Co-authored with C. Elvander, G. Andersson, and S. Cnattingius
Published in *BJOG: An International Journal of Obstetrics and Gynaecology*

The aim of Study III was to investigate the relationship between mode of delivery and subsequent childbearing. We investigated the probability of giving birth to a second and third infant by the mode of delivery of previous births. We also examined interpregnancy interval by mode of delivery. After excluding women with multiple births, stillbirths, missing or incomplete information, and forceps delivery, we ended up using data on 771,690 women who delivered their first singleton infant in Sweden between 1992 and

2010. Using Cox's proportional hazards regression models, we compared the risks of subsequent childbearing across four modes of delivery. We adjusted for potential confounders such as age, body mass index (BMI), height, morbidity, and infertility problems.

The main results were that, compared with women who had a spontaneous vaginal delivery, women who delivered by vacuum extraction were less likely to have a second pregnancy (HR 0.96, 95% CI 0.95–0.97), and that the probabilities of a second childbirth were substantially lower among women with a previous emergency cesarean section (HR 0.85, 95% CI 0.84–0.86) or an elective cesarean section (HR 0.82, 95% CI 0.80–0.83). There were no clinically important differences in the median time between first and second pregnancy by mode of first delivery.

Study IV—Does parental death affect fertility? A register-based study of the effect of parental death on adult children's childbearing behavior in Sweden

Stockholm Research Reports in Demography 2016:01

In the fourth and final study, I explored a possible intergenerational connection between two of demography's most researched topics: births and deaths. Study I demonstrated the intergenerational influence of fertility. In the fourth study, I introduced parental death into an analysis of the intergenerational influence of fertility. Throughout life, children are exposed to a wide range of parental influences. However, death is undisputedly the last parental event to occur. Using Swedish multi-generation registers linked to micro data on mortality and fertility, the fourth study investigates the short-term (first birth risk) effect of parental death on an adult child's fertility.

The principal finding is that a parental death occurring during children's reproductive age can have an effect on their first birth risk. The effects are

moderated by the child's gender and age. Younger individuals tend have a higher first birth risk following a parental death, whereas a parental death at older ages is associated with a decrease in the first birth risk.

7. Concluding remarks

I began this introduction chapter by describing the discipline within which this dissertation research has been carried out. I then described the consequences of fertility timing, which provided a motivation for research on fertility and its timing. Then, I continued by discussing predictors of fertility and its timing. In this final section, I will discuss the contributions of this dissertation and the linkages among its four empirical studies, relating them to demography as a discipline and to life course research as a general organizing framework. Finally, I will suggest further topics for research on fertility.

As discussed at the beginning of this introduction, demography may be defined in its narrow or broad senses. Demography has a tradition of being interdisciplinary, in that its theory, existing knowledge, and research design are often related to neighboring disciplines. It is both an academic and an applied science, often with a clear policy orientation, and with strong methodological development.

All four studies are interdisciplinary to some extent, being either collaborative work with scholars from neighboring disciplines (Study III) or building on work done in other fields (Studies I, II, and IV). Study I was influenced by stratification research, in its application of sibling correlations as a global measure of the effects of family background on the tempo and quantum of fertility. These sibling correlations were estimated using multilevel event-history models on siblings' entry into parenthood (Barber et al. 2000) and multilevel linear regressions on siblings' completed fertility. The results provided an estimate of the strength of family background effects on fertility and contribute to the growing research that uses intra-class correlations to

estimate the overall impact of family of origin on various outcomes in adulthood. Stratification research has used same-sex sibling correlations to estimate the impact of family of origin on income (e.g., Björklund et al. 2002) and school performance (Lindahl 2011), among other outcomes. Using twin data, similar methods have been used to estimate the heritability of fertility (e.g., Rodgers et al. 2001). Sister and brother correlations should also be of interest for researching other demographic issues. Some topics, such as divorce (Dronkers and Hox 2006) and family complexity (Raab et al. 2014), have to some extent already been explored. However, most studies that use sibling correlations have only estimated brother correlations. This is somewhat surprising, given that family of origin often has a different impact on daughters' lives than on those of sons. By reporting results for men and women, Study I also highlights the difference in the role of family of origin for men and women.

The results from Study I also provide suggestions for future research. One aspect concerns the question of what about the family of origin affects fertility. Most previous research has studied the intergenerational transmission of fertility by measuring the correlations in tempo and quantum of fertility between subsequent generations, but Study I highlighted that this is not sufficient for understanding the role of family background. Study II contributed to opening this remaining black box, but future research should also consider the potential effects of childhood neighborhood and other social environments than the family of origin.

Stratification research also served as an inspiration for Study II, in which I analyzed the effects of different socioeconomic background variables on entry into parenthood. Like Study I, this study contributed to the literature by showing that social background is indeed relevant when studying fertility and that different dimensions of social background cannot be used interchangeably. The impact of social background on various demographic outcomes, such as family formation (e.g., Bernhardt and Hoem 1985) and mari-

tal disruption (Lyngstad 2004), has previously been studied. However, few studies have considered the differences between different dimensions of social background. A more careful consideration of various dimensions of social background and socioeconomic status would be beneficial, especially in research where social background is the main interest. The same can be said of research in which social background or socioeconomic status is included as a control variable. In stratification research, the importance of different measures has already been demonstrated repeatedly (e.g., Elo 2009; Torssander and Erikson 2010). The finding that different dimensions of social background cannot be used interchangeably is relevant to other disciplines, including those outside the social sciences, in which the measurements are often used without considering their different meanings.

The results of Study II also highlight the need for further research on the inheritance of family demographic behavior because these behaviors can be part of the reproduction of social inequality across generations. If class of origin influences family demographic behaviors independently of educational attainment, and if these family behaviors affect life chances, then family demography can contribute to reproducing class differences across generations (McLanahan and Percheski 2008). The results of Study II do not, as such, provide evidence of a reproduction of inequalities through fertility timing, although they indicate that the possibility cannot be ruled out. Further research should examine this possibility.

Studies I and II also suggest future studies to explore why women's fertility is more affected by family origin than that of men. In the end of both Studies I and II, I briefly discuss some potential explanations for why women are more affected by their social background than men. One potential explanation is that parental influences over their children are negatively correlated with the children's age; also, because women are younger than men when they become parents, on average, they are also more responsive to parents' influences. A second explanation could be that women's role as

kinkeepers strengthens the parental influence. Another possible explanation, which I do not discuss in the studies, is that childbearing may be more closely related to women's gender role than men's and therefore plays a more important part of how women shape their sense of self. If this assumption is correct, then women might also be more likely to think of fertility behavior as important and therefore also be more likely to copy the proper fertility behavior from within their surroundings.

As shown in the section on the predictors of fertility and its timing, the advancements in ART and obstetric care have affected fertility. Study III, a collaboration between demographers and epidemiologists, is an example of demography's ability to bring research designs into and utilize data from other disciplines, and offers a venue for future research in demography. The contributions of Study III are twofold. First, the study shows that the use of one technology above another may have an impact on further fertility. Since the choice of mode of delivery is often between instrumental delivery and cesarean section, and the latter can have negative effects on the newborn, the mother's recovery, and future childbirth, it is essential to highlight all of the consequences of these methods. Our study also showed that vacuum extraction only has a negligible effect on birth interval exists, compared to non-instrumental vaginal delivery. Therefore, there are good reasons to promote this mode of delivery above cesarean section. Second, the study also underlined the need for demographers to evaluate the impact of the rapid developments in ART treatments and obstetric care on both the tempo and quantum of fertility. Not least, the impact of these technological developments on aggregate fertility (TFR and CFR) should be further investigated.

Study III highlights the promises of truly interdisciplinary research. The technical developments of ART and obstetrics have an impact on fertility behaviors, fertility outcomes, and delivery care. These developments have also had an impact on people's perceptions of the limits and possibilities of fertility. However, demographers are only beginning to research the im-

portance of these questions. These questions need to be further investigated in order to better understand how these developments affect people's understandings of their limits and possibilities of childbearing as well as fertility behavior and aggregate fertility measures. Not only register-based research but also cross-sectional studies should be conducted to determine how the development of ART and obstetrics care affects fertility.

Both the dependent (fertility) and independent (mortality) variables used in Study IV are core demographic measures. However, much of the theory linking these was taken from neighboring fields such as psychology, epidemiology, and medicine. Study IV adds to the existing knowledge by examining an intergenerational connection that had not previously been investigated at the micro level. The study contributes with its small part in unveiling the black box of intergenerational effects on fertility. The study has hopefully also contributed with knowledge that other fields can use, such as research on bereavement and life course theory. Above all, it increases the understanding of how demographic events and their implications are embedded in a social context, and that demographic outcomes can be affected by social relationships with kin and others. The study suggests two types of future research. First, parental death can have implications on demographic outcomes other than first birth risks. Future research could investigate whether parental death affects other family demographic behaviors such as family complexity and internal migration and emigration. Future research may also examine if other types of deaths, such as those of siblings, co-workers, or neighbors, affect demographic behavior. However, given the relatively small impact of parental death on fertility, it might not be that fruitful to study the effects of other types of death on fertility.

Studies I, II, and III can also have policy implications. Given that family of origin has stronger effects on women's fertility than on men's, the potential importance of family demography for the intergenerational reproduction of socioeconomic (dis)advantage can likewise be stronger for women than

for men. Policies to reduce work–family conflict can reduce these effects for women by decreasing the effects of family events on life chances, and by helping working women to establish families in the first place. Study III shows the need to consider the effects of different modes of delivery and promote alternatives to cesarean section.

Life course theory is based on five principles. First, it is based on the assumption that individual development continues into adulthood and individual life courses are affected by experiences in both childhood and later in life. Second, individuals construct their own life course, but, third, within the opportunities and constraints of historical and social circumstances, which also differentiate the experience and meaning of each life course event for different birth cohorts. Fourth, events and behaviors can have different meanings and implications for individuals, depending on when in life it occurs. Fifth, human lives are embedded in social relationships with kin and friends throughout life, referred to as *linked lives*. A divorce, a death, retirement, or the unemployment of one individual affects other individuals through social relationships (Elder 1994; Elder et al. 2003; Elder and Johnson 2003).

To various degrees, all five principles of life course theory are relevant to this thesis. Events occurring throughout an entire life affect and shape individual behaviors. Most of the consequences of early and late childbearing described in Section 3 influence and shape individuals in their adulthood. Events like becoming a parent, experiencing a particular mode of delivery, and being exposed to a parental death all have implications and create meaning for the individual's later life. The historical context within which an event occurs is related, because the meanings of early and late parenthood have changed over time. Technical developments in ART and obstetric care have changed the possibilities for late childbearing, and experiences with these technologies shape future childbearing. And, as shown in study IV, the same event can have different implications for individuals, depending on

when in life it occurs. The principle of linked lives, describing how individuals are embedded in social relationships throughout life, is perhaps the most central to this thesis. The primary objective of this dissertation was to contribute knowledge about social influences on fertility timing. The most uniting theme of these four studies is that they all connect fertility timing to individuals other than the index person. Study I showed how individual fertility is shaped by what individuals share with their same sex siblings, whether this is their genes, family of origin, social influences in the neighborhood, social networks, or other shared factors. Study II focused on more concrete aspects of this family background and showed how fertility is affected by parental social background. Finally, Study IV analyzed another parental influence: that of their death. Together, these findings highlight the different ways in which fertility behaviors are embedded in social relationships with kin and others throughout life, and contribute to the research on intergenerational and social network influences on fertility.

All four studies give strong reasons for additional research on how demographic events—such as migration, unemployment, retirement, and marriage—might affect family demographic behavior. Showing that individuals can be affected by events occurring in others' lives is important for understanding how human lives are embedded in social relationships with kin and friends. As already mentioned, some research of this type has already been done. Co-workers (Ciliberto 2010) and siblings (Lyngstad and Prskawetz 2010) have both been shown to affect each other's fertility timing. Kolk (2014) has expanded the research on the intergenerational influence on fertility to that on extended kinships. However, it is also possible to widen this kind of research by combining different types of social relationships with different demographic outcomes. The understanding of the main population processes—fertility, mortality, and migration—can all benefit from future research on how social relationships and life events interact with these processes.

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