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Intergenerational Transmission of Reproductive Behavior in Sweden, 1850-1889

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ABSTRACT

Previous studies have consistently observed intergenerational continuities in childbearing. This study uses individual-level parish records to examine the intergenerational transmission of fertility over the life course of women in Sweden during the fertility transition in the second half of the nineteenth century. Bivariate correlations, event history analysis and Poisson regression models are estimated for a large number of indicators of reproductive behavior. In line with the literature, the findings show evidence of intergenerational fertility correlations. The observed correlations are often small, but show that fertility transmission did occur during the demographic transition. The findings confirm our current understanding of intergenerational transmission and highlight the role of kin members in shaping reproductive outcomes.

Keywords: Intergenerational fertility transmission, Demographic transition, Sweden, Historical demography, Parental influences

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1 INTRODUCTION

The intergenerational transmission of reproductive behavior has received considerable attention from demographers in recent decades (Axinn et al. 1994; Bernardi & White 2010; Bittles et al. 2008; Bras et al. 2013; Dahlberg 2013; Fasang & Raab 2014; Jennings et al. 2012; Kolk 2014b; Murphy 1999, 2013a; Murphy & Knudsen 2002; Murphy & Wang 2001; Van Bavel & Kok 2009). Many studies on family formation emphasize the effects of kin members and experiences in early life on later life reproductive behavior (Bras et al. 2013; Sear et al. 2003). Parents undeniably play an important role in shaping the behaviors and views of their children concerning matters of childbearing. Correlations, though weak, between fertility levels of parents and children have been observed in a wide range of contemporary, post-transitional populations. In contrast, in pre-transitional populations with relatively high fertility and mortality rates, there is little evidence for the transmission of reproductive behavior from parents to children (Desjardins et al. 1991; Gagnon & Heyer 2001; Murphy 1999).

While most studies focus on pre-transitional historical or contemporary developing populations, or on contemporary post-transitional populations, the aim of this study is to examine the occurrence of intergenerational transmission of fertility during a period of demographic transition, similar to Jennings et al. (2012) and Reher et al. (2008). Using parish register data, life courses are reconstructed for women born in Sweden between 1850 and 1889 (N=8,172). During the period of this study, Sweden underwent a fertility transition, as birth rates fell from around 33 births per 1,000 individuals in 1860 to around 13 per 1,000 in 1930. This study provides further insight into the extent of intergenerational fertility transmission in the context of Sweden during this demographic transition in the second half of the nineteenth century, by examining several different indicators of reproductive outcomes, such as age at first birth, the number of children ever born and birth spacing. The effects of parental fertility outcomes on these indicators are compared to other studies on fertility transmission.

The following section provides a summary of the mechanisms used to explain childbearing continuities over generations, followed by an overview of the recent literature on the intergenerational transmission of fertility behavior. In the subsequent section, hypotheses are formulated on the basis of the literature. The sections thereafter introduce the data, methods and measures before presenting the results. Finally, the outcomes of this study are discussed in light of the recent literature.

2 BACKGROUND

2.1 PARENTAL INFLUENCES ON FAMILY FORMATION

Parents are likely to play an important role in shaping the views of their children on matters concerning parenthood. Previous research has indeed consistently observed correlations between reproductive outcomes of parents and children, although there is little correlation observed in historical, pre-transitional populations (Murphy 1999). Before further describing the findings of recent literature in greater detail, we first briefly consider three mechanisms behind the transmission of reproductive behavior which are addressed in the literature: shared genetic dispositions (Bras et al. 2013; Fisher 1930; Rodgers et al. 2001), shared environmental factors such as the transmission of socioeconomic status (Barber 2001; Jennings & Leslie 2013) and childhood socialization (Anderton et al. 1987; Axinn et al. 1994; Bernardi 2004, 2013).

In both of the earliest studies (Fisher 1930; Pearson et al. 1899), as well as more recent studies (Bras et al. 2013; Kohler et al. 1999), genetic dispositions are used to explain intergenerational childbearing continuities. Accordingly, intergenerational transmission is either a consequence of physical conformation caused by biological advantages or limitations to producing offspring, or resulting from genetic predispositions towards larger or smaller family sizes (Kohler et al. 1999; Miller et al. 1992; Rodgers et al. 2001). These genetic predispositions include psychological traits, such as childbearing motivations, causing similarities in fertility behavior between parents and children (Miller et al., 1992). Studies have shown that the degree to which genetic effects are expressed, depends on the interplay between social norms and economic constraints. In other words, reproductive outcomes depend on how genes interact with the environment (Low 2000; Udry 1996). Kohler et al. (1999) for instance observe strong intergenerational fertility transmission for Danish women born during the nineteenth-century demographic transition, as well as the late 1950s and early 1960s. They argue that the heritability of fertility was expressed more during these decades in particular because individual choice was less constrained and deliberate fertility decisions could be made more freely. In contrast, they found weak transmission for female cohorts born at the turn of the twentieth century. During this period, economic crises and the First World War formed shared environmental effects which were more relevant for fertility outcomes than heritable factors operating through individual choice. Fertility outcomes were not transmitted from parents to children when individual choice was constrained. Similar effects have been observed by Bras et al. (2013) in their study on nineteenth-century Dutch siblings.

Fertility transmission is also explained in the literature by the transmission of social status (Bengtson 1975, Anderton et al. 1987; Jennings & Leslie 2013). Status transmission may cause the life courses of parents and children to be shaped by similar constraints and opportunities, causing their beliefs, values and behaviors to be alike. The effect of social status transmission on reproductive behaviors, such as age at marriage and the timing of first childbirth, is shown to vary between social classes, religious denominations, genders and regions (Murphy 1999, 2013a; Van Bavel & Kok 2009; Van Poppel et al. 2008). However, as these studies also show, intergenerational continuities in reproductive outcomes are not completely explained by socioeconomic control variables (Murphy & Knudsen 2002; Murphy & Wang 2001, 2003).

The third explanation, social influences of parents on the reproductive behavior of their children, has received broad attention from the work of Duncan et al. (1965) and more recently Bernardi (2004, 2013). Duncan et al. (1965: p. 508) observed "that family size has a tendency to run in families". They suggested that the childbearing behavior of parents influences the reproductive preferences of their children through childhood socialization. In other words, people who had many siblings were more likely to prefer having more children themselves because such behavior was observed from their parents. Later work by Thornton (1980) showed that not only the behavior but also the values of parents regarding childbearing, represented by their statements about the ideal size of a typical family, had a positive effect on their children's expectations regarding the size of their own family (c.f. e.g., Axinn et al. 1994; Axinn & Thornton 1996). Using a qualitative, sociodemographic perspective, Bernardi (2004, 2013) describes the socialization mechanisms through which children adopt parental values and norms regarding family and fertility. Both direct and indirect socialization mechanisms can be distinguished. Direct, or primary, mechanisms are the use of rewards and punishments to make children adopt what parents see as appropriate behavior. Direct mechanisms are forms of explicit support or control (Smith 1988). In contrast, through indirect, or implicit, socialization children reproduce the behavior and roles set by their parents when they formulate their own views on what constitutes parenthood (Duncan et al. 1965; Thornton 1980). Bernardi and Klärner (2014) use the term 'social learning' to describe the idea that children learn from the actions and behaviors of other people, as well as the consequences of these actions. Early life experiences of growing up in a large family can produce awareness of the consequences of having a large family for physical and mental resources. Such awareness, stemming from early life experiences, may affect fertility decisions in later life.

2.2 INTERGENERATIONAL CONTINUITIES IN CHILDBEARING

The above section describes three commonly mentioned mechanisms explaining intergenerational childbearing continuities. While genetic dispositions, status transmission and childhood socialization explain part of the observed fertility transmission, the explained variation is often low and the association between reproductive outcomes and explanatory variables is weak, leaving a large role for other factors to determine the fertility of the children's generation (Kolk 2014a, 2014b). In an extensive survey of the literature, Murphy (1999) points out three main characteristics of childbearing continuities observed in empirical studies. First, the association between reproductive outcomes of parents and children appears to be almost null for historical, pre-transitional or contemporary developing populations. The association however increased over time, and for post-transitional populations the correlation is significant and positive (c.f. Murphy 2012). Furthermore, although the relationship may seem fairly weak (Pearson correlation coefficients observed in the literature range from 0.06 to 0.2), the impact is as large as that of employment status or education levels (Murphy 1999; Murphy & Wang 2001). Second, some studies suggest that the birth order of children affects to what extent their reproductive behavior is correlated to their parent's reproductive behavior. Third and last, the observed correlations are in most cases somewhat higher for the family of the wife compared to the husband's family of origin (Murphy 1999).

Recent demographic studies focusing on the intergenerational transmission of reproductive behavior generally confirm Murphy's (1999) observations. Studies employing data from pre-transitional populations, either historical or contemporary developing populations, show no or weak correlations between reproductive outcomes of parents and children. An exception is Pluzhnikov et al. (2007) who find a positive Pearson correlation coefficient of 0.31 for the total number of children born for men and their parents, and a positive correlation of 0.23 for women and their parents. Their study is based on data from the traditional Hutterite population, known for its high natural fertility rates. In a study using data from the Dutch Caribbean in the 19th and 20th century, Jennings and Leslie also find that women and men from larger families were more likely to have more children themselves. However, other indicators of childbearing continuities, for instance age at first or last birth, provide less consistent results. Furthermore, the extent of transmission differed along gender and race, suggesting that individuals who had a broader range of choices available regarding reproduction were more likely to display a higher correlation with fertility outcomes of their parents (Jennings & Leslie 2013). Using family reconstitution data from English parishes between the sixteenth and nineteenth century, Langford and Wilson (1985) find no correlation between fertility of daughters and their mothers, except for one parish. Gagnon and Heyer (2001) also find that the intergenerational correlation of completed family size is almost zero for French-Canadian settlers in the seventeenth and eighteenth century. These studies show that there is mixed evidence for intergenerational transmission of reproductive behavior in pre-transitional populations where birth and death rates are high.

A key condition for the transmission of reproductive behavior seems to be a fertility transition, marked by the occurrence of a persistent fall in birth rates. Several studies focus on the transmission of reproductive behavior during a fertility transition. For example, Vogl (2016) uses micro data from 48 contemporary developing countries and observes that the transmission of reproductive outcomes increased only as country-level birth rates declined. Similar patterns are observed in studies using data from historical populations. Using data on descendants of Utah pioneers of the mid-nineteenth century, Jennings, Sullivan and Hacker (2012) observe an increase in the correlation for indicators of reproductive behavior between generations. During the period of their study, marital fertility rates declined from 11.0 in the pre-1850 birth cohort to 7.2 in 1890-1899 birth cohort (Jennings, Sullivan and Hacker 2012). Similarly, Bras, Van Bavel and Mandemakers (2013) find evidence for an increase in intergenerational transmission of fertility over the course of the Dutch fertility transition in the nineteenth century. Reher, Ortega and Sanz Gimeno (2008) also find that the transmission of fertility behavior increased over the course of the demographic transition in 19th century Spain. However, the increased correlation in their study is evident only for indicators of completed family size, but not for the timing of reproductive events.

Studies on post-transitional populations generally show a positive correlation between reproductive behavior of two, or in some cases three generations (Barber 2001; Booth & Kee 2009; Kim 2014; Kotte & Ludwig 2012; Lyngstad & Prskawetz 2010; Rijken & Liefbroer 2009; Tropf et al. 2015). There is some evidence for regional variations in the degree of transmission, which is partly explained by the strength of social relationships between family members (Bernardi 2004, 2013; Mönkediek et al. 2017). The increased availability of data since the twentieth century also allows for the use of innovative methods for studying the intergenerational transmission of fertility. Fasang and Raab (2014) for example use sequence analysis to examine family formation and childbearing patterns over the life course of twentieth-century Americans. They observe that the strength of the emotional bond between parents and children, as well as educational upward mobility, explains intergenerational patterns of reproduction. In another study, using twentieth-century Finnish register data, Raab et al. (2014) show that reproductive outcomes also exhibit similarities among sibling dyads. Other recent studies make use of data on twins to examine the exogenous effects of additional childbirths or to differentiate between genetic and shared environment effects (Bras et al. 2013; Kohler et al. 1999; Kolk 2015; Tropf et al. 2015).

With regard to Sweden, a considerable number of studies makes use of twentieth-century Swedish population register data to study the intergenerational transmission of fertility. Most of these studies observe significant positive correlations between reproductive outcomes of parents and children. For example, Stanfors and Scott (2013) find that Swedish women born between 1970 and 1989 were more likely to start childbearing at young age if their mothers had their first child at a relatively young age, also when controlling for education and employment. Dahlberg (2013) finds a positive correlation between the number of children born for mid-twentieth century Swedish index persons and their parents, although a higher correlation is observed between index persons and their siblings. Kolk

(2014a) also finds that completed fertility outcomes are positively, though weakly, correlated between individuals and their parents. Additionally, he observes that reproductive outcomes of index persons are also associated with those of their grandparents, aunts and uncles. In another study, Kolk observes that the transmission, measured as the association between parental family size and the timing of first and later births, can partly be explained by intergenerational continuities in education and socioeconomic status, although other factors – including the transmission of values and preferences regarding family size – are more important (Kolk 2014b). The causal effect of having another sibling on fertility outcomes is further examined in Kolk (2015). He finds that the birth of younger twin siblings as an exogenous source of additional siblings is not strongly related to completed fertility. While people from larger families do tend to have more children themselves, Kolk (2015) argues that the observed fertility correlations in post-transitional countries are more connected to preferences shared by parents and their children regarding fertility behavior, such as the timing of having children or preferences regarding family size. The studies on twentieth-century Sweden thus show that fertility outcomes are explained by family of origin, and that the transmission may work to through different channels. The above overview of the literature confirms Murphy's (1999) observation that there is little evidence for intergenerational transmission of reproductive behavior in historical or contemporary pre-transitional populations. Although there are exceptions, e.g. Pluzhnikov et al. (2007), positive correlations between fertility outcomes of parents and children are more likely to be observed in transitional or post-transitional populations (Murphy 1999).

2.3 FERTILITY DECLINE IN NINETEENTH CENTURY SWEDEN

The Swedish demographic transition took place in the second half of the nineteenth century. The crude death rate began to decline in 1810 from a high, pre-transitional level of about 30 deaths per 1,000 individuals, with considerable yearly fluctuations, to around 11 deaths per 1,000 in 1940. The crude birth rate started to decline around 1860 and reached a post-transitional level by around 1930, marking the completion of the demographic transition. The Swedish population grew from around 2.3 million in 1800 to 3.5 million individuals in 1850 and 5.1 million in 1900 (*Statistics Sweden*).

Studies on family formation in Sweden during the nineteenth century show that marriages were characterized by considerable equality between men and women. The Marriage Act of 1734 banned forced marriages and equal inheritance rights for men and women were formalized by the Civil Code of 1845 (Lundh 2003). However, parents did remain influential in the choice of a suitable partner. For members of the farming community, the motivation behind the parents' influence is particularly clear. Equal inheritance rights could risk the continuation of the family farm if the lands were split after marriage (Dribe & Lundh 2005). By marrying a partner of equal wealth, families could make financial arrangements in order to ensure that landholdings remained intact. Moreover, parents would rely on their children for their retirement, so it was important that the farm could support them as well at older ages. These influences of the parents on the choice of a suitable partner are also visible in legislation. The father acted as a guardian for his unmarried daughters, and parents had the right to disinherited their children, daughters as well as sons, if they married against their parents' will (Lundh 2003).

Within marriage, reproductive health concerns motivated birth control during the second half of the nineteenth century (Kling 2010). The average number of children born remained relatively high, but evidence suggests that couples used birth spacing as a strategy for family planning. Bengtsson and Dribe (2006) and Kolk (2011) show that Swedish couples did not necessarily limit fertility in order to achieve a desired family size, but spaced their births in reaction to socioeconomic conditions. Birth control within marriage became more common during the nineteenth century as the intervals from marriage to first birth, and first to higher order births became longer over time (Junkka & Edvinsson 2015).

Agriculture was the main source of income in Sweden until the middle of the nineteenth century. In some areas, such as Tuna parish, iron mining industries provided employment to a large part of the population (Low 1991; Low & Clarke 1991). After around 1850, industrialization occurred rapidly and the expansion of foreign trade brought about growth in the small, open economy of Sweden (O'Rourke & Williamson 1995; Edvinsson & Nilsson 2000). With the exception of the capital of Stockholm, Swedish towns were small compared to other Western-European countries (Alm-Stenflo 1994; Schön 1997). The percentage of people living in cities of more than 5,000 inhabitants increased from around 6.8 percent in 1850 to 19.3 percent in 1900 in Sweden, while the average percentage in Europe increased from 16.4 per cent to 30.4 per cent in the same period (Bairoch & Goertz 1986).

2.4 HYPOTHESES

According to the literature, there is little evidence for positive fertility transmission in historical, pre-transitional populations. In contrast, post-transitional populations show positive, although weak, correlations between fertility outcomes of parents and children. Most studies explain the observed correlation in post-transitional or contemporary populations by the wider range of choices available to young couples in shaping their reproductive career (e.g. Jennings & Leslie 2013). Given that this study is based on a sample from a population undergoing a transition from high to low fertility levels, it is hypothesized that *fertility outcomes are positively associated with the family of origin* (H1). The assumption is that a period of fertility transition is marked by a change in behaviors and attitudes towards reproductive choices. Nonetheless, since most studies find only weak positive effects, with Pearson correlations ranging from 0.06 to 0.2, the observed correlations are likely to be similarly small. Murphy (1999) observes a greater influence of the mother's family of origin than of the father, although he acknowledges that this finding may be based on a highly selected population (Murphy 1999: p. 142). Given the nature of Swedish marital relationships at the end of the nineteenth century, characterized by equality between partners, it is hypothesized that *there are no or little differences in childbearing continuities between the husband's and wife's family of origin* (H2). Finally, although highlighted by Murphy (1999), this paper does not focus on birth order effects.

Previous studies on fertility transmission have focused on different indicators of reproductive behavior, such as completed fertility (e.g. the number of children ever born), the timing of first birth, the length of birth intervals between subsequent childbirths and age at last birth (c.f. e.g.. Jennings et al. 2012; Kolk 2014b; Reher et al. 2008). To facilitate discussion and comparison with other studies, this study includes multiple measures of fertility outcomes, and information on the families of origin of both the wife and the husband.

3 DATA, MEASUREMENTS AND METHODS

3.1 SAMPLE CONSTRUCTION

This study uses data from the POPUM and POPLINK databases from the Demographic Database (*CEDAR*). The Demographic Database (DDB) data is based on church registers which contain information from household registers, birth and baptism records, banns and marriage records, death and burial books and information on migrations (Alm-Stenflo 1994; Jeub 1993; Westberg, Engberg & Edvinsson 2015). The data includes information on the relationships between individuals (e.g. parent-child or husband-wife), which facilitates the linking of people over generations. The DDB sample used for this study contains basic demographic information for Swedish individuals born between 1820 and 1920 in a selected number of parishes, mostly in the Northern regions of Sundsvall and Skellefteå. Not all parishes in these regions are included in the DDB sample that was available for this study.

From the DDB sample, a selection is made of first-married women born between 1850 and 1889 who have given birth to at least one child. These individuals form the basis of the analytical sample and are referred to as "index persons". First, all index persons are linked to their spouses using the relationship indicators available in the sample. The links given in the data between index persons and their spouses are evaluated using the date of marriage and date of first childbirth. For instance, if the date of first childbirth of her spouse was not registered on the same day, it is likely that the spouse had children from a previous marriage or that the spouse was not correctly linked. In such rare cases, the woman is excluded from the analytical sample. Index persons who migrated into a parish that is included in the DDB sample after their eighteenth birthday, meaning they were not observed in the data before their eighteenth birthday, are also excluded from the analytical sample.

Individual life histories are constructed for each individual index woman starting from her birth until the end of the observation period. The life events recorded for each individual are: her birthdate, birthdate of her spouse, date of first marriage, all childbirths including stillborn children and the end of the observation period. The end of the observation period is defined by her own death, the death of her spouse, marriage dissolution, or migration into a parish not registered in the sample for a period longer than three years. Since the DDB data covers multiple parishes, it is sometimes possible to follow individuals after migration as long as the destination parish is included in the sample. The time span from the date of birth of each individual to the end of the observation period is referred to as the time during which a person is followed, or *under observation*. The period during which index persons are followed thus depends on the date of the end of observation and some people are followed only for a few years after marriage.

Next, each individual woman, or index person (G2), is linked to both her own parents and to her parents-in-law (G1). Life histories are reconstructed for the parents and parents-in-law in a similar way. For each index person, mother and mother-in-law in the analytical sample, the following indicators of reproductive behavior are created:

- Age at each childbirth
- Age at first marriage
    - Second marriages are excluded
- Number of children ever born
    - Only for women who are followed until age 45 or who died before age 45
- Number of children born at age 25, 30 and 35
    - Only for women who are followed until the age of 25, 30 or 35 years
- Number of children surviving to age 8
    - The total number of children born minus the number of children passing away before reaching 8 years old. Only for women who are followed until age 45 or who died before age 45.

For each variable, the deviation from the individual's birth cohort mean is calculated (10-year cohorts). This procedure reduces the effects of changes in the level of fertility over time and allows us to focus on childbearing continuities. Additionally, the birth cohort and region (*län*) of birth are entered for each index person. For the number of children ever born, two measures are constructed: one where the mother is observed until the age of 45, and one until the age of 30 years. There are two reasons for this. First, not all index persons are observed until the age of 45, due to migration, marriage dissolution, or death. The average life expectancy for women born in 1860 was around 46 years, increasing to 53 years in 1890 (*Statistics Sweden*). Second, the observation window for the parents of index persons could also be too short to observe these individuals until the age of 45, for the same reason. A simplified overview of the relationships between individuals in the analytical sample, including the terms used to refer to the different generations: parents, index persons and children, is shown in figure 1.

Figure 1 Schematic kinship diagram

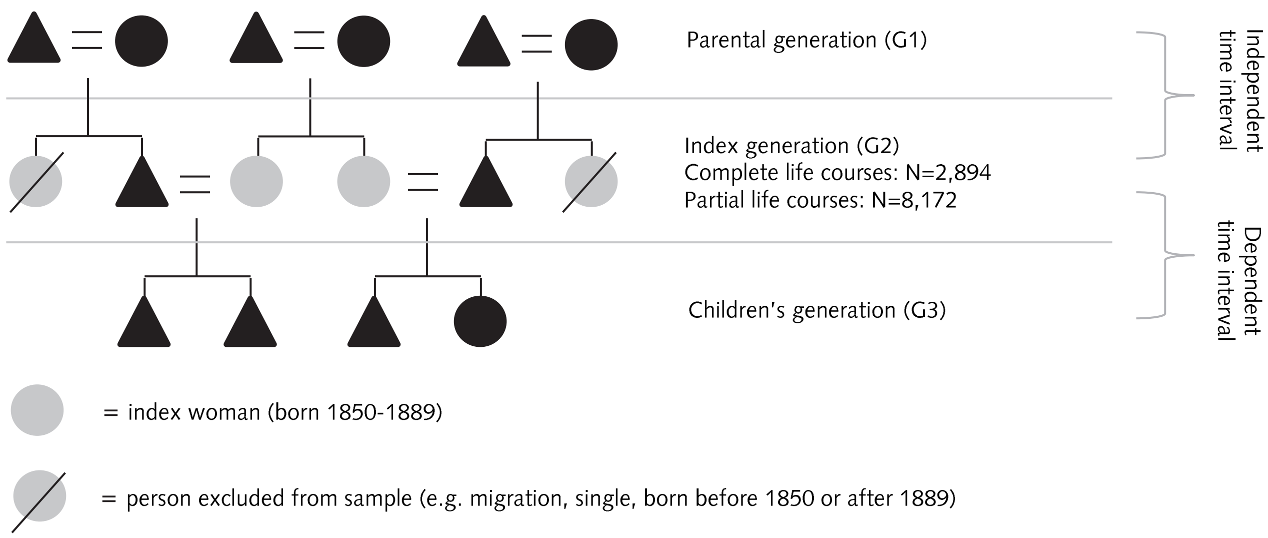


Figure 1 shows the crucial role of the availability of information on both the index person as well as her parents or parents-in-law for estimating the presence of fertility transmission. For example, in case an index person (G2) or parent (G1) migrated into a region that is not available in the sample before this person reached 45 years, it is not possible to estimate the effects for the transmission of family size for this person. However, with such partial life histories, it may still be possible to examine other transmission effects such as age at marriage or the timing of childbirths.

In order to examine fertility transmission, several different models are estimated. The sample size of each model depends on whether the variable of interest required the use of complete or partial life histories. When only index women for whom the complete reproductive history of herself and that of both her own parents and parents-in-law are considered, the sample includes 3,109 index women. For these 3,109 women, there is information on their spouses, all childbirths and all childbirths of both her mother and her mother-in-law. The sample is larger if the age at first birth is examined of index women who are linked to their own mothers, since it is not necessary to include only complete life histories to examine age at first birth (N = 8,172).

Since previous studies have shown that the intergenerational transmission of reproductive behavior varied between social classes (Murphy 1999; Van Bavel & Kok 2009; Van Poppel et al. 2008), control variables are included for the occupation of the husband around the time of marriage. The DDB data includes information on occupation in the form of HISCO codes, which are converted into HISCLASS codes (Van Leeuwen & Maas 2011; Van Leeuwen et al. 2004). The HISCLASS codes reflect a crude hierarchy between broad occupational groups. Since group sizes were small, the HISCLASS groups are combined into the following four social classes: foremen to higher managers, farmers, medium and lower skilled workers and unskilled workers. Given the strict selection criteria, necessary for the construction of individual life histories, the analytical-sample is largely composed of index persons who were not likely to migrate themselves and whose parents were not likely to migrate. Although in some cases it is possible to follow individuals after migration, most often such persons are lost from the analysis causing an early end to their observation window. This may explain the large share of people working in agriculture (67.5% to 71.8%) throughout the period covered in the analytical sample, even though the industrial revolution took off in the mid-nineteenth century. Another limitation of the sample selection procedure is that childless couples are excluded from the analysis.

Table 1 provides descriptive information for all index women, as well as their mothers and mothers-in-law. The selection of index women in table 1 is limited to women for whom information is available on the complete reproductive history of both her own parents (mothers) as well as her husband's parents (mothers-in-law).

As table 1 indicates, the number of children born for women who are observed until the age of 45 or their death was on average about 5.8 to 6.1 children, with the majority of children surviving to at least eight years old. The number of children born did not change much during the period of observation. For the whole of Sweden, crude birth rates started to decline from the 1860s until the 1930s (*Statistics Sweden*). Given that this sample is largely composed of families who were not likely to migrate, and because the share of people involved in agriculture is fairly high (around 70 percent), relatively high and stable birth rates can be expected. When comparing the number of children born for index women to the number of children born for their mothers or mothers-in-law (around 6.5 to 7.4), a small decline in family size over the generations is visible. A bias in the sample can be observed towards larger family sizes for mothers and mothers-in-law. Mothers and mothers-in-law of index women born in 1880-1889 had more children on average than parents of index women born in 1850-1890, even though index women born in 1850-1859 could be the mothers of the index women born in 1880-1889. The likely cause of this bias is the selection of index women who are followed from age 18 to 45. Mothers and mothers-in-law may have been followed for a longer period of time after their 45th birthday than index women, causing more childbirths to be registered for the mothers compared to the index women. For the number of children born at age 30, the difference is much smaller. Finally, age at first birth is slightly lower for the parental generation than for the index women's generation.

Table 1 *Descriptive information for index women with complete reproductive history of the parents and parents-in-law*

Indicator	Index woman's birth cohort				
Index woman [a]	1850-1859	1860-1869	1870-1879	1880-1889	N
Age at first birth (in years)	26.2	25.0	25.0	25.5	4,310
Age at marriage (in years)	25.7	24.6	24.4	25.0	4,310
Number of children ever born [b]	5.8	6.1	6.0	5.8	3,109
Number of children born at age 30	2.2	2.5	2.3	2.4	4,310
Number of children surviving to age 8 [b]	4.8	5.1	5.2	5.3	3,109
Mother					
Age at first birth	24.4	24.9	24.9	24.7	4,310
Age at marriage	23.5	24.0	24.2	24.0	4,310
Number of children ever born	6.5	6.6	7.1	7.6	4,310
Number of children born at age 30	2.6	2.5	2.7	2.9	4,310
Number of children surviving to age 8	5.3	5.3	5.9	6.5	4,310
Mother-in-law					
Age at first birth	24.9	25.3	25.4	25.2	4,310
Age at marriage	24.2	24.7	24.8	24.7	4,310
Number of children ever born	6.6	6.7	7.1	7.4	4,310
Number of children born at age 30	2.8	2.6	2.6	2.8	4,310
Number of children surviving to age 8	5.3	5.4	5.8	6.3	4,310
Husband's occupation					
Foremen to higher	6.1%	5.6%	5.5%	9.1%	
Farmers	67.5%	69.5%	71.8%	69.9%	
Medium and lower skilled	22.2%	21.3%	18.0%	17.9%	
Unskilled	4.2%	3.7%	4.8%	3.0%	
Index woman's birth county					
Jämtlands län					118
Norrbottens län					255
Västerbottens län					1,801
Västernorrlands län					795
Östergötlands län					1,013
Other					328

Notes:

a) Selection limited to women for whom information is available for both mother and mother-in-law. All variables are mean values, except when stated otherwise.

b) Sample further restricted to women and mothers followed age 18-45 or death before their 45th birthday.

3.2 METHODS

In order to facilitate comparisons with other studies on the intergenerational transmission of reproductive behavior, bivariate correlations between the reproductive variables of interest for both generations are examined first. Pearson correlation coefficients are calculated separately for index women and their families of origin, and for index women and their husband's families of origin. Additionally, the results are shown by birth cohort to determine if the association between fertility of parents and their children (the index women) has changed during the period of observation.

After examining the bivariate correlations, we proceed to a series of event history analyses of the length of birth intervals for the first four parities. While bivariate correlation coefficients are widely used in the literature and useful to assess correlation, the drawback is that other variables are not controlled for. By using event history analysis it is possible to control for other factors such as cohort effects. In addition, it is possible to model the transition from one life stage to the next. Separate event history models are estimated for the age at first marriage and the timing of the first four childbirths. For each of these dependent variables, the following reproductive characteristics of the parental generation are examined in separate models: Age at first birth (or age at marriage in case age at marriage is the dependent variable); children ever born; children ever born at age 30 and the number of children surviving to the age of eight years old. The effects for the index person's parents and parents-in-law are estimated simultaneously. For each reproductive variable of interest, the following Cox proportional hazard model is specified:

$$h_i(t) = h_{0,C,R}(t) \cdot \exp(\beta_1 X_{i,mother} + \beta_2 X_{i,mother-in-law} + \beta_3 S_i)$$

In this model $h_i(t)$ denotes the hazard ratio, or the chance of marrying or having a (next) birth in period t based on the covariates that are specified. The dependent variable of interest is thus either the age at marriage, age at first birth, or the length of the time interval between births. The variable $h_{0,C,R}(t)$ is the unspecified, non-negative baseline hazard which varies arbitrarily over time and is not dependent on the covariates in the model. This can be interpreted as the constant chance of having a child between period t and $t+1$. This baseline hazard is the same for all index women, but is allowed to differ between birth cohort C and birth region R (a stratified model is specified). The Cox model assumes that the hazard ratios are proportional, meaning that the effects of the covariates do not vary over time. An analysis of the Schoenfeld residuals for each model showed that the effects of birth cohort and region were not constant over time. To resolve this, each model is stratified by birth cohort and region in order to ensure proportional hazards (Cleves et al. 2010). The effects of the index-person's family of origin and her husband's family of origin are determined simultaneously. The hazard for index person i at moment t is dependent on the indicator of reproductive behavior X of both the mother and mother-in-law, as described above. Additionally, all models include fixed-effects control dummies, denoted by S_i. The additional fixed effect control variables are: the husband's occupation, age of the index woman at previous birth, the death of a previous child within eight months after birth, the death of a previous child surviving to eight months but before the birth of the current child and a dummy variable for last birth. The β parameters are unknown regression coefficients that are to be estimated using maximum likelihood.

Finally, continuities in completed family size are examined using Poisson models. This class of regression models is suitable for estimating the effects of covariates on count data, such as the number of children born. As with the event history analyses, the effects of both the mother and mother-in-law of each index person is examined simultaneously. Separate models are estimated for the indicators of reproductive behavior of the parental generation, and all models include fixed effect control variables of the wife's birth cohort, birth region and the occupation of her husband.

4 RESULTS

The bivariate correlations between indicators of reproductive behavior are examined first. The results are presented separately for the index women's mother and mother-in-law in table 2. Next, the correlation coefficients are shown by birth cohort in table 3, to determine whether the degree of the intergenerational transmission of reproductive behavior varied over time. Then, a summary of the results of the event history analyses of birth events is presented in table 4 and finally the results of the Poisson models for completed family size are given in table 5.

4.1 CORRELATION COEFFICIENTS

Table 2 provides correlation coefficients for the indicators of reproductive behavior between index women and their mothers and mothers-in-law, respectively. For example, the estimated Pearson correlation coefficient between age at first birth of an index woman and her mother is 0.0281. The correlation between age at first birth of index women and their mothers-in-law is 0.0627. The influences of other risk factors, such as cohort effects or differences in social status, are not controlled for with the estimation of correlation coefficients. Nevertheless, the estimates allow for a simple comparison with other studies and have become widely used in the literature on intergenerational transmission (Murphy 1999). The correlations presented in table 2 are given for subsamples of the data for which sufficient information is available for the index women and her mother or mother-in-law for each examined variable.

Table 2 *Bivariate Pearson correlation coefficients for index women and their mothers(-in-law)*

	Mothers			**Mothers-in-law**		
Index women's indicator	**Coefficient**		**N**	**Coefficient**		**N**
Fundamental fertility links						
Age at first childbirth	0.0281	*	7,673	0.0627	***	7,031
Relative age at first childbirth [a]	0.0382	***	7,673	0.0665	***	7,031
Number of children ever born	0.0849	***	5,008	0.0456	***	4,670
Relative number of children ever born [a]	0.0853	***	5,008	0.0546	***	4,670
Number of surviving children [b]	0.0903	***	5,032	0.0568	***	4,673
Relative number of surviving children [a]	0.0799	***	5,032	0.0611	***	4,673
Other indicators						
Age at marriage	0.0391	***	8,172	0.0651	***	7,264
Number of children ever born						
at 25 years	0.0682	***	8,172	0.0558	***	7,264
at 30 years	0.0767	***	8,172	0.0690	***	7,264
at 35 years	0.0948	***	8,172	0.0778	***	7,264
Relative number of children ever born [a]						
at 25 years	0.0701	***	8,172	0.0768	***	7,264
at 30 years	0.0787	***	8,172	0.0889	***	7,264
at 35 years	0.0948	***	8,172	0.0941	***	7,264

Notes: Bivariate Pearson correlation coefficients
*Significance: *** p< 0.001, ** p<0.01, * p<0.05, + p<0.1*
The number of observations is higher than in table 1 where only women for whom information of both the mother and mother-in-law is available are included.
a) Relative to birth cohort of index person and parent
b) Surviving to 8 years

All indicators of reproductive behavior in table 2 show a significant, positive correlation between the index women and their mothers or mothers-in-law, but the correlation observed is, however, fairly weak. The correlation between age at first childbirth of index women and their mothers-in-law is stronger than between index women and mothers. In contrast, measures of completed fertility show a stronger correlation between index women and mothers compared to mothers-in-law. The correlation coefficients for completed fertility (ρ=0.0849, N=5,008) between index women and their mothers are low compared to contemporary low-fertility societies in which correlations of ρ>0.15 are not uncommon (e.g. Murphy & Wang 2001). The observed correlation is also slightly lower than observed in other regions that underwent a phase of fertility transition. Reher et al. (2008) for example observed a higher correlation coefficient (ρ=0.115, N=409) in their sample of women born in Spain whose first birth took place between around 1890 and 1950. Nevertheless, the observed correlation in completed family size is similar to other studies that use data from historical, transitional societies. Jennings et al. (2012) report the same correlation (ρ=0.085, N=19,938) in their study on the intergenerational transmission of reproductive behavior of women born in nineteenth-century Utah. When comparing the correlation between the number of children ever born to the cohort-relative number of children ever born, little differences emerge. The correlation between index women and their mothers-in-law increases slightly, but remains lower than between index women and mothers. The same is visible for the number of children surviving to the age of 8 years, here the correlation between index women and their mothers is higher than between index women and their mothers-in-law.

Age at marriage is also positively correlated between generations. As with age at first birth, the correlation coefficient for age at marriage between index women and their mothers-in-law (ρ=0.0651) is slightly higher than between index women and their mothers (ρ=0.0391). Perhaps this is an indication of the role of the husband's family in affecting the timing of marriage in the Swedish context. Given that the birth of the first child usually followed within a limited time span after marriage, it can be argued that the husband's family of origin had a somewhat stronger influence than the wife's family on the timing of marriage and first childbirth. The observed correlation between age at marriage of index women and their mothers or mothers-in-law is however lower than what is found in other studies. Jennings et al. (2012) observe a correlation between index women and mothers of ρ=0.121 in the Utah context, while Van Poppel et al. (2008) observe a correlation of ρ=0.167 using nineteenth-century marriage certificates from the Netherlands. Lastly, the number of births at various ages shows a relatively high correlation between index women and their mothers or mothers-in-law, with values ranging from ρ=0.0558 at the age of 25 to ρ=0.0948 at the age of 35.

Table 3 *Intergenerational correlation coefficients by birth cohort of index women*

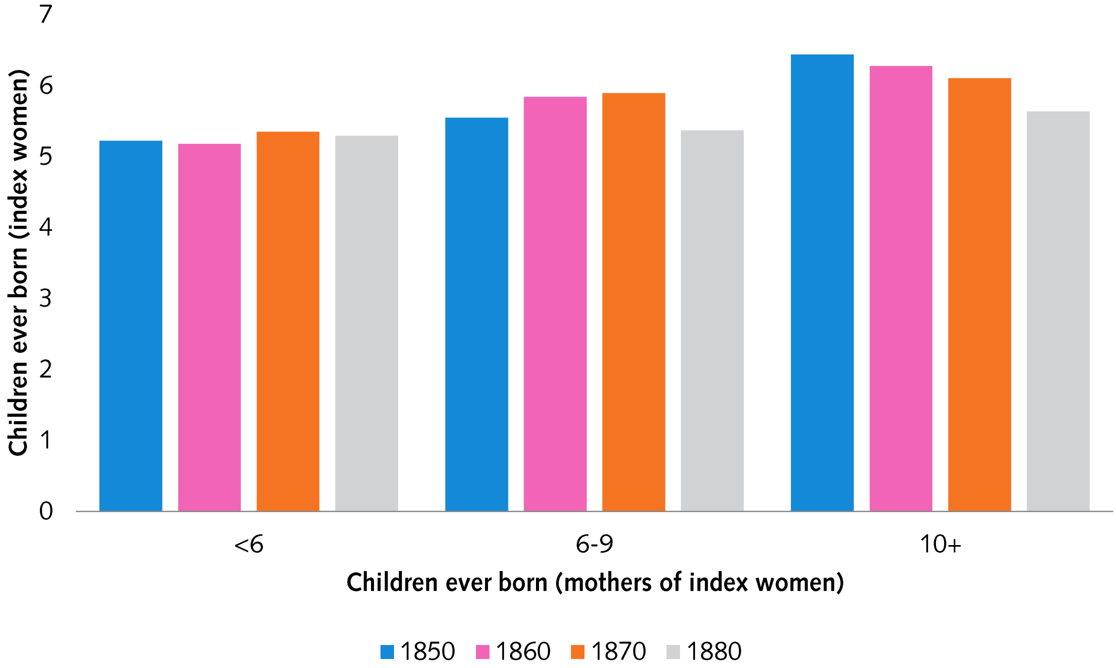
	Index women / mothers				**Index women / mothers-in-law**			
	Birth cohort index woman				**Birth cohort index woman**			
Index woman's indicator	1850-59	1860-69	1870-79	1880-89	1850-59	1860-69	1870-79	1880-89
Age at first child-birth	-0.009	-0.009	0.060**	0.112***	0.125***	0.025	0.069**	0.076**
Relative age at first childbirth [a]	-0.007	-0.006	0.061**	0.107***	0.159***	0.054**	0.092***	0.105***
Age at marriage	0.011	0.027	0.039	0.112***	0.119***	0.057**	0.075***	0.042
Number of chil-dren ever born	0.112***	0.108***	0.075**	0.0549*	0.076*	0.069*	0.016	0.036
Relative number of children ever born [a]	0.113***	0.111***	0.071*	0.053	0.081*	0.074*	0.022	0.051
Number of surviv-ing children	0.127***	0.0733**	0.091**	0.049	0.129***	0.054	0.034	0.018
Relative number of surviving children [a]	0.128***	0.0747**	0.087**	0.045	0.132***	0.061*	0.044	0.036

Notes:
Pearson correlation coefficients
*Significance: *** p< 0.001, ** p<0.01, * p<0.05, + p<0.1*
[a)] *Relative to birth cohort of index person and parent*

Bivariate Pearson correlation coefficients over birth cohorts of index women are given in table 3. In line with what is observed in other literature, the correlation between the age at first birth of index women and their mothers increased over time (Murphy 1999, 2013a). In contrast, other indicators of reproductive behavior show no sign of an increase in the correlation between generations over birth cohorts. The correlation for the number of children born is significant between index women and their mothers for all birth cohorts, but the size of the correlation coefficient decreases from ρ=0.112 in 1850-1859 to ρ=0.0549 in 1880-1889. The change in the correlation of the number of children ever born is further illustrated by figure 2.

The vertical axis of figure 2 shows the number of children born to mothers of index women in three groups (less than 6 children, 6 to 9 children, and 10 or more children). Each group is further divided into the birth cohort of the index woman. The vertical axis shows the average number of children ever born to index women. The graphs show that index women whose mother had more children, on average had more children themselves. However, for index women whose mother had more than 10 children, the number of children ever born shows a decrease over time. Thus, while the mean number of children ever born remained constant over time with around 5.8 to 6.1 children born per women (see table 1), the number of index women having a relatively large offspring compared to their birth cohort declined over time. This decline in the share of large families in later birth cohorts may explain for a part why the correlation in the number of children born is not consistent over time.

Figure 2 *Number of children ever born by index women (birth cohort 1850-1890) and their mothers*



4.2 AGE AT MARRIAGE AND PARITY TRANSITION

Next, event history analysis is used to examine the association between indicators of reproductive behavior of the parental generation and the index women at various stages of the life course. These models include controls variables for birth cohort and birth region of the wife, socioeconomic status of the husband, and previous reproductive outcomes (depending on the model, see the *Methods* section). In total 20 models are estimated, and summary outcomes for each event history model are presented in table 4. Each row presents the hazard ratios for a single model in which the characteristics of the wife's parents and husband's parents are simultaneously taken into account. Hazard ratios are exponentiated coefficients. If the hazard rate is greater than 1, an increase in the corresponding covariate will increase the hazard of the dependent variable. A hazard rate smaller than 1 denotes a smaller hazard of the dependent variable occurring, if the covariate increases. Since the dependent variable is a time interval, for example the time between births, a hazard rate greater than 1 for any covariate indicates that a one-point increase of the covariate is associated with a smaller time interval between births, since the hazard of the next birth occurring in the next time period has increased. The hazard ratios reported are proportional and must be interpreted as the chance of the event occurring relative to the unspecified baseline hazard which is constant for all index women, but stratified by birth region and birth cohort of the wife. In order to ensure proportional hazard ratios, all models are stratified by these variables. By specifying a stratified model, the direct effects of birth cohort and birth region are controlled for in the model, but their effects are not visible because they are included in the unspecified baseline hazard function.

The left-most column in table 4 describes the dependent variables of interest for the index women. These are the age at marriage, age at first birth and the transition time from first to second birth, second to third and third to fourth birth. The second column describes the independent covariates, limited to the indicators of reproductive behavior of the parental generation. The independent variables of the index women's parents are the age at marriage or first birth, the number of children ever born, the number of children ever born at the age of 30 years and the total number of children surviving to the age of 8 years. All variables, both the dependent and the independent, are included as cohort relative measures to the birth cohort of the index women and their mothers(-in-law) respectively. This means that a higher hazard is associated with a higher risk of the event occurring, relative to the birth cohort of the index women. The number of observations for these models are slightly lower than those given in table 1. This is due to the fact that for some index women, the occupation of her husband around the time of marriage could not be determined. In such cases, these index women are excluded from the event history analysis.

Table 4 *Summary table of Cox proportional hazard models*

		Mother	Mother-in-law	N (failures)
Indicator of index women (cohort relative [c])	*Indicator of mother / mother-in-law (cohort relative [d])*	*Hazard ratios*		
Age at marriage [a]	Age at marriage	0.977**	0.980***	4,039
	Children ever born	0.994	1.018**	3,973
	Children ever born at age 30	1.031**	1.045***	4,041
	Number of surviving children [e]	0.99	1.01	4,000
Age at first birth [a]	Age at first birth	0.982**	0.982***	4,001
	Children ever born	0.996	1.020**	3,812
	Children ever born at age 30	1.031**	1.044***	3,879
	Number of surviving children [e]	0.991	1.012+	3,839
Transition to 2nd child [b]	Age at first birth	0.995	0.999	3,356
	Children ever born	1.018**	1.007	3,329
	Children ever born at age 30	1.025*	1.006	3,383
	Number of surviving children [e]	1.015*	1.011	3,353
Transition to 3rd child [b]	Age at first birth	0.993	0.992	2,768
	Children ever born	1.021**	1.019**	2,746
	Children ever born at age 30	1.002	1.028*	2,791
	Number of surviving children [e]	1.022**	1.028***	2,766
Transition to 4th child [b]	Age at first birth	0.982*	1.016**	2,243
	Children ever born	1.017*	1.008	2,226
	Children ever born at age 30	1.013	0.985	2,259
	Number of surviving children [e]	1.013	1.017+	2,239

Notes:
Each row reports hazard ratios for indicators of parental fertility on the reproduction parameters of index women. The coefficients for the transition models are given as exponentiated coefficients (hazard ratios) relative to the baseline hazard.
*Significance: *** p< 0.001, ** p<0.01, * p<0.05, + p<0.1*
a) Relative to the index woman's birth cohort. The models include additional fixed effect control variables for the husband's occupation (not shown) and are stratified by birth cohort and region.
b) Relative to the index woman's birth cohort. The models include additional fixed effect control variables for the husband's occupation, age of the index woman at previous birth, the death of a previous child within eight months after birth, the death of a previous child surviving to eight months but before the birth of the current child and a dummy variable for last birth (not reported). All models are stratified by birth cohort and region.
c) Relative to the birth cohort of the index woman.
d) Relative to the birth cohort of the index woman's mother or mother-in-law.
e) Surviving to 8 years.

The first row in table 4 shows that index women were likely to marry at a higher age compared to other women in their birth cohort, in case their mother or mother-in-law married at a higher age (compared to their birth cohort). Controlled for the effects of the wife's birth cohort, birth region and her husband's occupation, the hazard ratios for age at marriage of the index woman's mother and mother-in-law are smaller than one (0,977 and 0,980). This means that the chance that the index woman will be married in the next year is around 2.3 percent lower if her mother was one year older than her cohort peers when she married. This finding is in line wither earlier observations by Van Poppel et al. (2008). The positive hazard ratio of 1.018 in the second row in table 4 shows that the index women's age at marriage is inversely associated with the relative number of children born to her mother-in-law. This means that if the index woman's mother-in-law had more children relative to her birth cohort, the index woman was likely to marry at a younger age compared to her cohort-peers. Additionally, the hazard of marrying younger is higher for women whose mother or mother-in-law had more children at the age of 30 relative to their birth cohorts.

Age at first birth, relative to the index women's birth cohort, is likely to be slightly higher for index women of whom the mothers or mothers-in-law had their first child at a higher age relative to their birth cohorts, since the hazard ratio has a value of <1. This positive association is expected, given the positive correlation for age at first birth observed in table 2. The size of the husband's family is inversely associated with age at first birth. A hazard ratio for age at first birth depending on children ever born with a value of 1.020 indicates that women whose mother-in-law had relatively many children would be more likely to have their first child at a younger age, compared to other women in her birth cohort. This association is however not observed for the family size of the wife herself. Nevertheless, the number of children born to either the mother or mother-in-law at the age of 30 is significantly associated with age at first birth. The more children mothers or mothers-in-law of the wife had at the age of 30 years, the younger index women were likely to enter parenthood relative to the average age at first childbirth for their birth cohort. The number of surviving children of the husband's family is only weakly associated with age at first birth.

Looking at the transition to higher order parities, the association between reproductive outcomes of index women and their mothers or mothers-in-law becomes less clear. The age at first birth of the mother and mother-in-law is only significantly associated with the waiting time between the third to the fourth birth, but not for other parity transitions. Interestingly, a higher age at first birth of the index woman's mother is significantly associated with a longer birth interval for index women. In contrast, the higher age at first birth of the mother-in-law is associated with having a shorter birth interval from the third to the fourth child. Both the number of children born and the number of surviving children of the wife's mother are inversely associated with the transition to the second and third birth for index women, meaning that the interval between the second and third birth is shortened if the mother of mother-in-law had more (surviving) children. For the transition to the third birth, this association is also significant for the husband's family of origin. The finding that shorter birth intervals occur among women whose parents had more children is also observed in other studies, although other studies observe more consistent parental influences on the timing of births at higher parities (e.g. Jennings et al. 2012; Kolk 2014b).

4.3 CHILDREN EVER BORN

Finally, the associations between the number of children born and indicators of reproductive behavior of the parental generation are examined in four Poisson regression models. Table 5 reports a summary of the coefficients. As in table 4, each row represents a single model. Each model includes the fertility characteristics of both the wife's and the husband's parents, as well as fixed effect control variables for the wife's birth cohort, region of origin and the husband's occupation. In order to explain the number of children ever born to index women, the following measures of parental fertility are used for the wife's and husband's mother: the age at first birth, the number of children born, the number of children born at the age of 30 and the number of children surviving to age 8.

The findings from table 5 confirm the picture that emerged from the results of the event history analyses and what is observed in other literature (e.g. Jennings et al. 2012; Kolk 2014b; Murphy 1999). The number of children born is significantly and inversely associated with the timing of entry into parenthood of the parents. The later a woman's mother or mother-in-law had her first child, the fewer children the index women is expected to have. Furthermore, if the parents or parents-in-law had more children, or had more children when they were 30 years old, the index women is also likely to have more children ever born. The only insignificant result is for the association between the number of children born and the number of surviving siblings of index women. The association with the number of siblings of the index woman's spouse is however significant and positive.

Table 5 *Summary table of Poisson regression models*

		Wife's mother	Husband's mother	N
Indicator of index woman (absolute value)	*Indicator of parents (cohort relative)*	*Poisson regression coefficients*		
Children ever born [a]	Age at first birth	0.987***	0.995**	2,914
	Children ever born	1.006*	1.009**	2,894
	Children ever born at age 30	1.014**	1.019***	2,930
	Number of surviving children [b]	1.004	1.013***	2,907

Notes:
Each row reports the coefficients of indicators of parental fertility on the index women's number of children born. Coefficients for the Poisson models are reported as incidence-rate ratios.
*Significance: *** p< 0.001, ** p<0.01, * p<0.05, + p<0.1*
[a)] *Absolute number of children born (not relative to the index women's birth cohort). The parent's indicators of reproduction are relative to the birth cohort of the index woman's mother or mother-in-law. All four models include fixed effect control variables for the birth cohort and birth region of the index woman, and for the husband's occupation (not reported).*
[b)] *Surviving to 8 years old*

The findings displayed in tables 2 to 5 confirm the first hypothesis. Fertility outcomes are positively associated with reproductive outcomes of the parents. For the second hypothesis, the results are less consistent, as there are differences between the effects of the husband's and wife's family of origin. For some measures, the reproductive behavior of index persons seems to be more strongly associated with the husband's family of origin than that of the wife, but this result is not consistent as in some cases fertility outcomes were more strongly associated with the wife's family of origin. The differences between the effects of the husband's and wife's family of origin are most visible in the examination of bivariate correlations over the birth cohorts of index women (table 3). These show a significant correlation between the age at first birth and age at marriage of index women and their mother's-in-law in the earlier cohorts, but not for the wife's mother. In contrast, the waiting time until the second birth seems to be associated with fertility outcomes of the wife's family of origin, but not with the husband's family of origin (table 4). While Murphy's (1999) overview shows that most studies show a stronger association with the wife's family of origin, the stronger influence of the husband's family of origin is also observed in other studies. For example, in a study on Norwegians born in the 1960s, Cools and Hart (2016) find that men having more siblings were more likely to have three instead of two children themselves. In contrast, women with additional siblings were not more likely to have more children themselves (Cools & Hart 2016).

5 SUMMARY AND DISCUSSION

Previous studies have consistently observed small, but significant intergenerational continuities in childbearing for contemporary, post-transitional populations, but not for historical pre-transitional populations (Dahlberg 2013; Kolk 2014b; Murphy 1999; Stanfors & Scott 2013). The main aim of this study has been to examine whether reproductive outcomes are transmitted from parents to children during a period of fertility transition. For this, data was collected for women born in Sweden in the second half of the nineteenth century. While fertility decline took off in Sweden since the 1860s until the 1930s, reproductive outcomes observed in this study remained relatively constant throughout this period, signifying that the population in this sample was only in an early phase of the fertility transition. The findings show evidence of weak, but positive correlations in reproductive outcomes between parents and children during a period of fertility transition.

In order to facilitate comparisons with existing literature, bivariate correlations were examined for a large number of indicators of reproductive behavior. These show consistent correlations between the reproductive behavior of parents and children. The observed correlations are however slightly lower than what is observed in other European regions undergoing a period of fertility transition (c.f. Reher et al. 2008). Over time, the correlations between the age at first birth of parents and their children increased, as is observed in other studies (c.f. Jennings et al. 2012; Murphy 1999). In contrast, the transmission of the number of children born decreased over time (table 3). A likely explanation for the decreased association over time is that for the children's generation fewer large families are observed in later birth cohorts, even for those individuals whose parents had many children (figure 2). Over time, family sizes remained fairly constant on average, but the number of exceptionally large families (more than 9 children) became smaller.

A series of event history analyses shows that the timing of marriage and entry into parenthood are also associated with reproductive outcomes of the parents after controlling for birth cohort, region and socioeconomic status. Although it is not possible to directly compare the hazard ratios with Pearson correlations, the hazard ratios for entry into parenthood seem low in comparison to the bivariate correlations reported in Table 2. The control variables included in the event history models may be important drivers of reproductive outcomes themselves, thereby taking away some of the explanatory power of the parental influences. For higher order parities, less consistent effects of parents on the fertility of their children are observed. Finally, Poisson models for the relationship between the number of children born and fertility outcomes of parents show positive correlations, consistent with the literature (Jennings et al. 2012; Kolk 2014b; Murphy 1999).

The results of this study are inconclusive as to whether the wife's or the husband's family of origin had a stronger influence on reproductive outcomes. For some measures, e.g. the number of children ever born, the reproductive outcomes of the husband's parents were more strongly associated with fertility outcomes of the index couple, but for other measures it was the other way around. For most measures of reproductive outcomes, however, the reproductive outcomes of the family of origin of both the wife and husband were associated with fertility of the index couple. Large differences between the effects of husband's and wife's family of origin were not to be expected, given the context of the study and the nature of Swedish relationships in the nineteenth century. Around 70 per cent of the index couples sampled in this study were farmers and due to the data selection procedure, the sample was mostly comprised of non-migrating couples. Dribe and Lundh (2005) argue that in central and northern Sweden, social differences between groups were smaller than in southern Sweden. Moreover, because children inherited an equal share, famers sought partners who were evenly wealthy to compensate for the splitting of lands through inheritance. This also suggests that the transmission of social status may have been the most important mechanism behind the transmission of reproductive outcomes in nineteenth-century central and northern Sweden. The social status of index couples did not differ much from that of their parents, as individuals were likely to marry to members of the same social group. This was reinforced by the influence of the parents on finding a suitable partner for their children.

In practice, the reproductive behaviors of individual couples are only partly explained by the reproductive behaviors of their parents. The influence of other kin members on fertility behavior is recognized in both historical and contemporary developing countries (Bernardi & White 2010; Rotering & Bras 2015; Sear et al. 2003; Tymicki 2004). Furthermore, biological limitations as well as economic or social constraints and opportunities also play a role (Bengtsson & Dribe 2006). Kolk (2011) for example shows that couples spaced their births in reaction to socioeconomic or family circumstances. Historical events, such as the devastating fires that destroyed most of the cities of Umeå and Sundsvall in 1888, likely affected fertility planning to a greater extent than parental influences. Nevertheless, intergenerational childbearing continuities are persistent in contemporary developed countries, highlighting the topic's importance for scientific study in the context of modern low-fertility populations as well as developing nations (Murphy 2013b).

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