Spatial vs. social distance in the diffusion of fertility decline: Evidence from Sweden 1880-1900

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Abstract

The emergence and diffusion of fertility control strategies as part of the demographic transition are usually not occurring randomly in space and time. Next to individual-level characteristics also prevailing socio-economic contextual conditions as well as geographic characteristics such as distance to centers of the decline seem to be relevant. However, most existing studies on the fertility decline focus either on macro-level trends or on micro-level studies with limited geographic scope. Much less attention has been given to the interplay between individual characteristics and contextual conditions including geographic location. With this paper we aim to contribute to close this existing research gap. We use 100% individual-level samples of the Swedish censuses in the years 1880, 1890 and 1900 which include detailed information on socio-economic status. Multi-level models are applied to link these individuals to contextual information on the local parishes they were living in. Our main research question is whether in this initial phase of the fertility decline in Sweden social distance or spatial distance were more relevant as constraints for the diffusion process. Did people adopt the behavior from nearby persons independent of social class differences, or were they more likely to adopt it from persons with similar social status, even if they were not living in the same location? Our preliminary results suggest that in this initial phase of the decline social class differences were putting higher constraints on the diffusion of the fertility decline compared to spatial distances. This is in line with theoretical considerations by Szreter (1996) on "communication communities".

This work is part of the project "Towards the modern family. Socioeconomic stratification, family formation and fertility in a historical perspective", funded by the Swedish Research Council and the Crafoord Foundation.

“The nebula-like cluster is a common trait in the spatial picture of man’s attributes. Take any atlas showing economic and cultural elements and you will find an endless sequence of spatial distributions which have a concentrated core surrounded by a border zone of outwards decreasing density. There is nothing such as one single and simply explanation [...]. But nevertheless one particular process which creates this type of distribution—temporarily or as an end result—seems to be highly significant: diffusion of techniques and ideas through the network of social contacts”

Torsten Hägerstrand (1965)

Introduction

The decline of fertility in the demographic transition has for a long time been a major theme in contemporary and historical demography. Much of the literature has been focusing on the demographic aspects of the decline aiming to chart the process without actually explaining it. Other research has offered explanations to the decline mainly at the macro level; while much less attention has been given to disaggregated patterns and micro- as well as multi-level analyses. Fertility decline is often viewed in the framework of innovation and adjustment (Carlsson 1966), where the first explains fertility decline as a diffusion of new knowledge or attitudes to fertility control, while the latter sees the decline as a result of an adjustment of behavior to new circumstances and a greater motivation to limit fertility.

According to the innovation perspective, fertility before the decline was not deliberately controlled, but “natural” (Henry 1961). Thus, marital fertility was not affected by parity-specific stopping but determined by the length of birth intervals, and these in turn were to a large extent determined by the length of breastfeeding and the level of infant and early child mortality. According to this perspective the fertility decline was mainly a result of the innovation of families to start limiting family size by terminating childbearing after having reached a target family size (cf. Coale and Watkins 1986; Cleland and Wilson 1987). The emergence of deliberate birth control involved transmissions of new ideas and changing attitudes and norms concerning the appropriateness of fertility control within marriage. It also involved acquiring knowledge of how to limit fertility, but many believe this knowledge to have been present long before the decline even though it might not have been used for parity-specific control, but for spacing of births or avoiding childbearing in difficult times (see, e.g., Bengtsson and Dribe 2006; David and Sanderson 1986; Dribe and Scalone 2010; Santow 1995; Szreter 1996; Van Bavel 2004).

According to the adjustment perspective, fertility decline is viewed as a response to changes in the motivation of having children. In the theoretical framework outlined by Easterlin and Crimmins (1985), both the demand and supply of children are important in explaining the high pre-transitional fertility. The supply of children is defined as the number of surviving children a couple would get if they made no conscious efforts to limit the size of the family (Easterlin and Crimmins 1985). Thus, it reflects natural fertility as well as child survival. High mortality in pre-transitional society (low supply) together with a high demand for children implied that demand exceeded supply. Fertility decline is explained by adaption to processes which influenced the demand and/or supply side. This includes reductions in child mortality (Galloway et al. 1998; Reher 1999; Reher and Sanz-Gimeno 2007), as well as changing costs of children e.g. as a result of economic changes in food and housing prices or of government interventions to limit child labor or increase the period of schooling. In addition, high costs of fertility regulation lead to a time lag between these changes in demand/ supply and children ever born. These regulation costs were at least partly determined by lack of knowledge or negative attitudes towards birth control. Diffusion of new ideas on these matters might, consequently, have contributed to declining fertility in this period.

Although there is growing empirical evidence for diffusion of ideas being an important part of the process (Schmertmann, Assunção and Potter 2010; González-Bailón and Murphy 2013; Goldstein and Klüsener 2013), little is known on the interplay between individual characteristics and contextual conditions including geographic location in this process. There is also a lack of analyses differentiating the spatial diffusion process by social class, although theoretical consideration and research results by Szreter (1996) indicate that such research could deliver very important insights. With this paper we aim to contribute to close these existing research gaps. We use 100% individual-level samples of the Swedish censuses in the years 1880, 1890 and 1900 which include detailed information on socio-economic status. Multi-level models are applied to link these individuals to contextual information for their parish of residence. We estimate the effects of socioeconomic determinants and spatial dimensions on net fertility, by controlling for several factors at individual and community level. Our main research question is whether in this initial phase of the fertility decline in Sweden social distance or spatial distance were more relevant as constraints for the diffusion process. Did people adopt the behavior from nearby persons independent of social class differences, or were they more likely to adopt it from persons with similar social status, even if they were not living in the same location? A second important research question is related to the importance of local structural conditions in shaping the diffusion process, and whether their relevance differs by social class.

Theoretical Considerations

From the viewpoint of Giddens' *Theory of Structuration* contextual socio-economic conditions and individual actions and decisions are interdependently linked (Giddens 1984). Individuals are in their actions influenced by existing societal norms and economic conditions in the context they are embedded in. However, to some degree they are also able to influence these contextual conditions, with which they ultimately contribute to human development and societal change. Thus, societal conditions such as being a pre- or post-demographic transition society are in the same time medium and outcome. Following this view, it is difficult to disentangle the effect of structural conditions on the adaptation of new behavior, as the adaptation process itself has repercussions on the structural conditions[1] (see also Bongaarts and Watkins 1996: 669). This is particularly true for the fertility decline during the demographic transition, which has e.g. tremendous implications for household budgets and time-budgets that adult individuals can allocate to gainful employment and human capital investments. Therefore, structural conditions in period t in location i might be very much related to the number of adaptors of new behavior in the preceding periods. In this sense, the study of the diffusion and adaptation process is not only of interest in terms of improving our understanding how social interaction functions, but it can also help to extend our knowledge how the fertility decline contributed to influence structural conditions for change.

The degree to which individuals are able to contribute to social change processes such as the adaptation of fertility control behavior during the demographic transition is likely to depend on their access to assets and information. This access varies by spatial context and social status. But before we look into this in detail, we will first discuss theoretical considerations

[1] To this is also referred to as social dynamics (Casterline 2001).

related to the onset of the fertility transition. Coale (1973) distinguishes three preconditions which all have to be met in order to set the stage for a fertility transition to occur. One is that couples have to be consciously aware that adopting the new behavior yields a number of benefits to them (*readiness*). Second the new behavior must be culturally acceptable (*willingness*). Third the technical means such as access to information on contraceptive techniques has to be available. Though these conditions are not undisputed (Eckstein and Hinde 2002) we consider them helpful to develop our theoretical consideration how social and spatial proximity might affect the diffusion process.

The benefits of reducing fertility were perhaps most evident in big cities, where individuals were faced with rapid social changes with all their benefits and drawbacks. While societal changes brought about new opportunities for social mobility especially for educated individuals, they also contributed to raising prices for housing and food. Thus, it is not surprising that big cities were usually early centers of the decline. To this might also have contributed that big cities provided higher anonymity and usually a more liberal context for deviating behavior. Thus the perceived risks by individuals that their adaption of fertility control strategies would seriously affect their social capital[2] were perhaps lower in big urban centers compared to rural areas. Losses of social capital might also have repercussions on the access to financial assets (disinheritance by parents, loss of job and career chances). Another factor that contributed to make big cities likely to be centers of the decline was their role as nodes of dense communication and transport networks.

Under the assumption that diffusion processes are important for the fertility decline it is relevant to mention that most of the social interaction in our study period was still local in character. Thus, it is likely that in the diffusion of the adaptation of this new behavior spatial distance was acting as an important constraint. In addition, it is also likely that particularly early adopters in a given location were faced with big uncertainties on how their local social network would perceive the adaption of fertility control strategies. Thus, it is likely that in such a process the diffusion is first most intense in areas adjacent to centers of fertility decline and in those locations where pioneers have already adopted the behavior, eventually creating the pattern that Hägerstrand (1965) referred to as nebula cluster, before the decline spreads out to more remote areas. Nevertheless, the emergence of such spatial pattern must not necessarily be linked to a social interaction process. It might also result as adaptation process to structural change changes with a spatial dimension (e.g. reductions in infant mortality spreading from the towns into surrounding areas).

Next to spatial distance it is also likely that social distance is putting constraints on the diffusion of behavior. In many studies of fertility decline elite groups have been identified as early adopters (Livi Bacci 1986, Haines 1992). Theoretical explanations for this might be linked to distinctive characteristics of elites. At least in historic times elite groups were the once which were most likely to maintain social networks across long distances which contributed to a better access to information. These social networks could comprise (kin-) relationships and contacts between members of similar higher-level professions living in different cities (Szreter 1996). Extensive social networks might also have developed by visiting one of the few higher education institutions or as part of a service in the higher ranks of the military. Evidence for elites of the same profession having very similar fertility trends, even if they lived in distant places, has been presented by Szreter (1996) in his seminal study on socio-economic differentials of the fertility decline in Britain. Based on his study he

[2] Social capital we understand in line with Bordieu and Wacquant (1992, p. 119) as the resources that “accrue to an individual by virtue of possessing *a durable network of more or less institutionalized relationships* of mutual acquaintance and recognition.

argued that “communication communities” of similar social background are very important to understand the mechanisms of the fertility decline process. While the interplay between spatial context and social class was not in the focus of his study, Szreter (1996: 580) argues that in order to properly test his hypothesis of communication communities it is important to conduct “properly contextualised comparative local studies”. Our study of 2,435 parishes covering all Sweden is perhaps the most far-reaching attempt in this direction so far.

But next to better access to information elites are also likely to differ in their access to assets and their local embeddedness, which might have affected what Coale referred to as willingness. The latter is particularly true for those elites that moved in non-metropolitan area to serve there, for example, as doctor, parish priest or in the local administration. Elite women in such non-metropolitan areas were compared to other women perhaps not only more exposed to new ideas on contraceptive behavior, but also in general more willing to adopt the behavior. This can again be based on social capital as well as social control considerations (see also Lesthaeghe 1980). Elite women might have been less embedded in social control networks at the local level for several reasons. One is that large shares of the elite were not living in their home parish anymore, making it likely that they were under looser control by other (older) family members. In addition, the status of being part of the elite already gave them a distinctiveness, which contributed to make it easier to take the risk to adopt this new behavior, even if it was unclear what neighbors or other social contacts in the locality might think about it.

Based on these theoretical considerations we develop the following working hypotheses: If spatial distance is the most important constraint in the diffusion of fertility control behavior in this early period of fertility transition in Sweden, we would expect the decline to cluster around early centers of the transition and important transportation and communication corridors. If social distance is more relevant, we would expect to see different diffusion patterns by social class, with the elite being the least constrained by spatial distance in the adaptation of the new behavior.

Data

We use micro-level data from three different Swedish censuses (1880, 1890 and 1900). In total, the 1880 census counts about 4.6 million persons in 1.2 million households from about 2,530 parishes, while the corresponding figures in the 1890 and 1900 censuses are 4.8/1.3 and 5.2/1.4 million, respectively. These data were digitized by the Swedish National Archives and are about to be published by the North Atlantic Population Project (NAPP) which adopts the same format as the Integrated Public Use Microdata Series (IPUMS) (Ruggles et al. 2011). All registered individuals are grouped by household. In this way, each individual record reports the household index number and the person index within the household. The parishes of residence and birth, age, marital status and sex of each person are also registered. A person’s relationship to the household head is recorded as well. In addition, there are family pointer variables indicating the personal number within the household of the mother, father, or spouse, making it possible to link each woman to her own children and husband.

The census data is linked to a historical GIS-file of Swedish administrative boundaries which has been set up by the Swedish archive. It provides the boundaries of all parishes that ever existed in Sweden since 1638, allowing us to construct a GIS-file with parishes of time-constant areas for the period 1880-1900. In total, we are able to divide Sweden up in 2,435 parishes, for which we derive information on contextual conditions based on the aggregated census data and distance measures. Because census data do not permit the computation of standard fertility rates (ASFR, TFR, etc.), we use an indirect measure of fertility called the child-woman ratio (CWR). The CWR has been traditionally defined as the number of children aged 0-4 per woman aged 15-49 (Shyrock and Siegel 1980). It is easy to see that the children under five may have been born during the five-year period before the census date, where the women were up to five years younger.

To ensure that we model recent net marital fertility, we only use own children under five and limit the sample to currently married women with spouses present. Thus, we create a sample of married women aged 15-54 from the three censuses to make sure that all children 0-4 to women 15-49 are included. Descriptive statistics of these samples are described in Table 1. In total we have about 600,000 married women in each census. We suspect that results of an analysis of marital fertility, if available, would be very similar to our analysis of net marital fertility. A comparison of net fertility (child-woman ratios) and marital fertility (based on the own-children method using SES-specific mortality data) for Malmöhus county in Sweden 1896-1900 indicates very similar results by social class (Scalone and Dribe 2012). Although unadjusted child-woman ratios were underestimated for high mortality groups in relation to low mortality groups, the relative positions of the different socioeconomic groups were the same for the adjusted and unadjusted child-woman ratios. In many ways net fertility is also a more informative measure of fertility as we expect the number of surviving children to be what families cared about, rather than the number of births. Even though some of the fertility transition came about to offset lower mortality (Galloway et al. 1998; Reher 1999; Reher and Sanz-Gimeno 2007; Dyson 2010.), it is obvious that the decline in net fertility, which by far exceeded the adjustments for mortality improvements, was much more important in the long run (Doepke 2005).

The dataset also offers detailed information on occupation, allowing classification into a fairly large number of social groups using the Historical International Standard Classification of Occupations (HISCO) classification system (Van Leeuwen et al. 2002), and from that, to identify which of 12 different historical classes each couple belonged to using the HISCLASS system (Van Leeuwen and Maas 2011), an international classification scheme based on skill level, degree of supervision, whether manual or non-manual, and whether residence was in an urban or rural area. The classification system contains the following classes: 1) Higher managers; 2) Higher professionals; 3) Lower managers; 4) Lower professionals, and clerical and sales personnel; 5) Lower clerical and sales personnel; 6) Foremen; 7) Medium skilled workers; 8) Farmers and fishermen; 9) Lower skilled workers; 10) Lower skilled farm workers; 11) Unskilled workers; and 12) Unskilled farm workers. To avoid problems of small numbers in some cases we use a more aggregated classification scheme based on six groups: Elite and upper middle class (HISCLASS 1-6), Skilled workers (HC 7), Farmers (HC 8), Lower skilled workers (HC 9-10), Unskilled workers (HC 11-12). The data also provide information on labour force participation, that is a derived dichotomous variable identifying whether a person aged 15 and above reports any gainful occupation.

Models and Variables

We estimate the association between socioeconomic status as well as other individual- and contextual-level characteristics and net fertility using ordinary least squares regression (OLS[3]) models and assuming as dependent variable the number of own children under 5 of a married women. We estimate different models at 1880, 1890 and 1900 census, comparing the effects of the spatial covariates at different times. We take a multi-level approach, allowing us to simultaneously control both for individual-level as well contextual parish-level covariates. In

[3] We choose an OLS instead of a Poisson-specification as some of our spatial methods for residual analysis have been developed for OLS-analyses and not thoroughly been tested for Poisson-models.

addition to the models including all women we also calculate models only considering members of specific classes. This includes models on the elite (HISCLASS 1-6), farmers (HISCLASS 8) and other social groups (HISCLASS 7, 9-12).

Socio-economic status is determined based on the occupation of the husband because in most cases they were the main providers in the families. We also include women's labour force participation using one individual and one community-level indicator. Naturally we would expect the individual measure to more closely reflect costs of children, but higher levels of labour force participation of women in the community can also be expected to affect behaviour of individual families though imitation and attitudinal change. Married women's labour force participation is difficult to measure because of the problem of farming and cultural expectations that likely resulted in an undercount of married women's labour force participation. To include all wives in the farming sector as employed would give much higher estimates than the ones presented here, where we have only included occupations noted in the sources (i.e. not wife). For example, according to the census figures, only about half a percent of all married women in the age group 15-54 were gainfully employed outside the farm around 1900 (see Table 1). According to the census of 1920 the corresponding figure was four percent (Silenstam 1970). Nonetheless, women who were recorded as employed can be expected to have faced much higher costs of childbearing making the variable a valid, although highly imprecise, indicator.

By using spatial information from the historical GIS, a 10 categories variable takes into account the distance to each of the three biggest Swedish towns (Stockholm, Gothenburg, Malmö). The reference category "<= 10 km from Stockholm" includes all married women living in a parish within 10 km from the centre of Stockholm. The other two categories "<= 10 km from Gothenburg" and "<= 10 km from Malmö" takes into account all married women who lived respectively within 10 km from the centre of Gothenburg and Malmö. Other categories also distinguish women living in parishes located within 10 and 50 and within 50 and 100 km around the centres of these three towns. A unique category includes women that lived in parishes situated more than 100 km away from any of the three considered towns. Finally, the degree of urbanization is measured by a proxy variable that is based on population density in each parish.

We also estimate the effects of several structural contextual indicators concerning degree of industrialization and education. Industrialization is measured by calculating the proportion of persons employed in industry in the parish of residence. This indicator is based on the HISCO coded occupations and calculated for the male population aged 15-64. Educational orientation is measured by the number of teachers in basic education per 100 children in school age (7-14 years). This variable has previously been found negatively associated with marital fertility in a county-level analysis (Dribe 2009). More teachers indicate a stronger orientation to education in the community. The community level child-woman ratio of the upper class (HISCLASS 1-6) is also included in separated models that are only related to farmers and other socioeconomic groups.

Two GIS-constructed variables related to migration are also included. First, information on the parish of birth allows us to calculate and control for life-time net-migration distance of the women at individual level. This categorical variable distinguishes three categories: "<= 10 km" for a woman who lived within 10 km from their parish of birth, "> 10 and <= 50 km" for a one who lived within 10 and 50 km, "> 50 km" for more than 50 km. Second, as contextual parish-level variables we take into account the proportion migrants in the community by life-time net-migration distance. In each parish, we consider the proportion of migrants that were born more than 100 km away. We assume that areas with high shares of migrants are more receptive to social change processes, as many persons in these areas are not deeply embedded in local intergenerational kinship and community networks, whose social control influence might slow down the pace of fertility control diffusion.

(Table 1.1)

We also control for several bio-demographic variables at both the individual and parish-contextual levels. Age of woman and age difference between spouses are included to control for well-known age dependencies in fertility, and children over four can be viewed as a control for marital duration, i.e. that the couple were at risk of having children for the entire preceding period. Controlling for whether or not the husband was the head of household, we expect non-heads to have lower fertility.

Descriptive Findings

Looking first at some descriptive measures of net fertility, Table 1.2 shows the child-woman ratios by socio-economic status in the three censuses. Overall, net fertility declines by about five percent between 1890 and 1900, but actually increases somewhat between 1880 and 1890. This increase could be related to infant and child mortality declining faster than fertility levels, as aggregate total fertility actually also declined in this period (Dribe 2009). It is also clear from the table that some groups experience pronounced fertility declines over time. The upper and middle classes experience declines of around 17 percent in net fertility between 1880 and 1900, while unskilled workers instead show an increase of 3 percent over the same period. Moreover, we find no indication of higher fertility in the elite groups before the transition for Sweden as a whole. Before reading too much conclusion into this, however, it is important to note that we have not controlled for differences between these groups in age or other variables.

(Table 1.2)

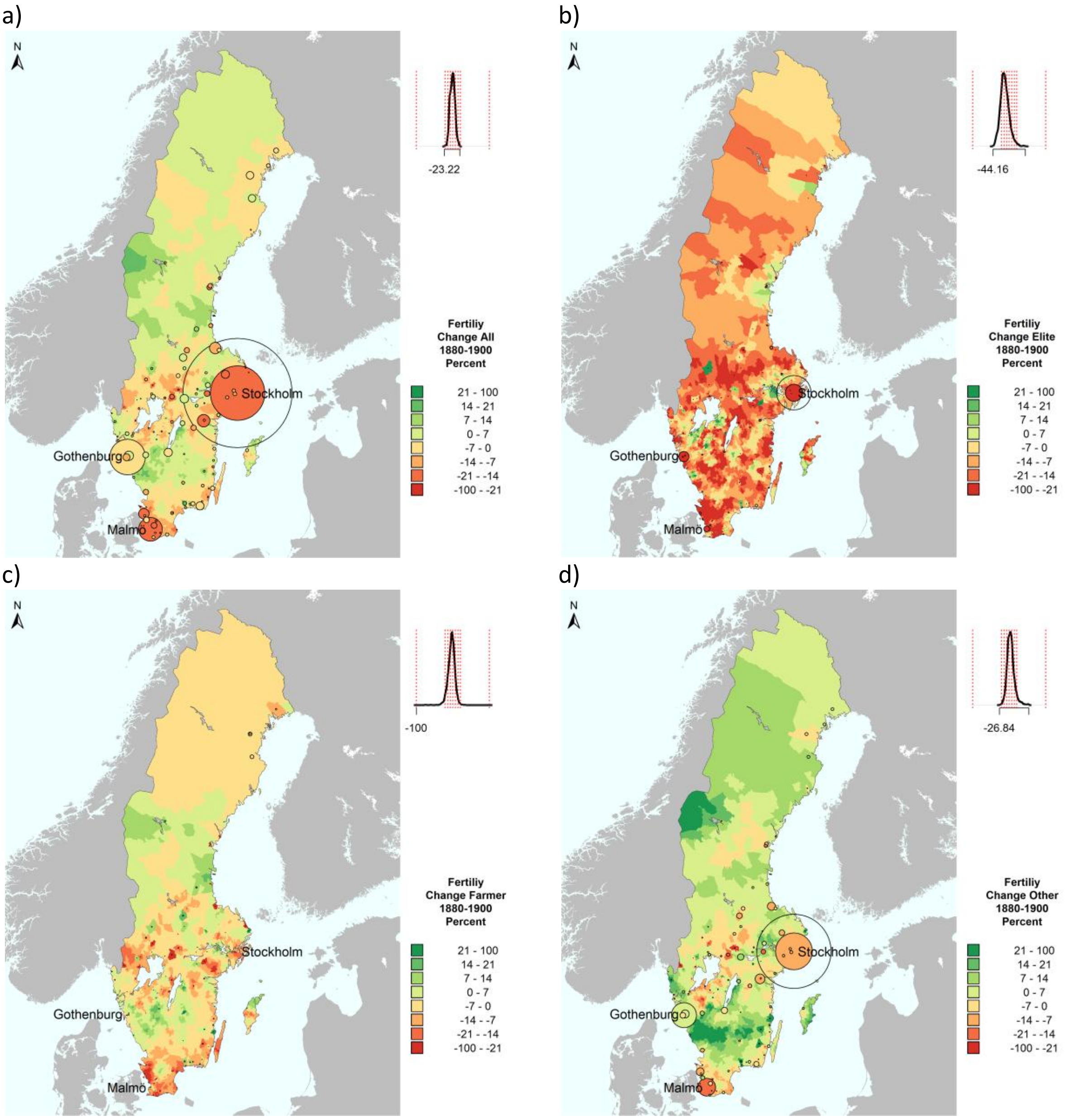
In presenting the results we fill first turn to the maps displaying spatial aspects of (net) fertility trends by social class (Figure 1). Fig. 1a shows for all women the changes in the child women ratio between 1880 and 1900, while the Figures 1b-1d display the pattern differentiated by the three social class categories for which we also calculate separate models (elite, farmer, other). In mapping the results by social class we are faced with the constraint that in some parishes there are only small numbers of elite women, which causes substantial noise. Thus, we decided to apply spatial smoothing procedures on the child women ratios for these parishes.[4] Bigger parishes/cities[5] are highlighted with circles which vary dependent on the number of women aged 15-49 in a particular social class. The map providing the trends for all women independent of their social class shows a pattern, which resembles to some degree Hägerstrand's (1965) description of a nebula-like cluster and which is very typical for cartographic representations of fertility decline pattern as part of the demographic transition (see e.g. the Princeton Maps in Coale and Watkins 1986; Schmertmann, Potter and Cavenaghi 2008; Goldstein and Klüsener 2013). The decline was concentrated on the big centers such as

[4] For all parishes with 75 and more residing elite women in 1880 we use the real rates. On the other parishes we apply a smoothing procedure in which we take the mean value of the CWR in the parish i and in the 19 parishes j whose centroids are closest to the centroid of parish i and who have less than 75 residing elite women in 1880. In this procedure, we exclude all values with NAs and 0. We adopted this approach instead of adding the children and married women in these 20 parishes to generate a CWR, as the latter procedure would give overly weight to bigger parishes.

[5] This includes all parishes with more than 75 residing elite women aged 15-49 in 1880.

Stockholm and Malmö[6], surrounding areas and central transport and communication corridors. This includes the lake area in central Sweden between Stockholm and Gothenburg.

Fig. 1 Changes in Child Women Ratio



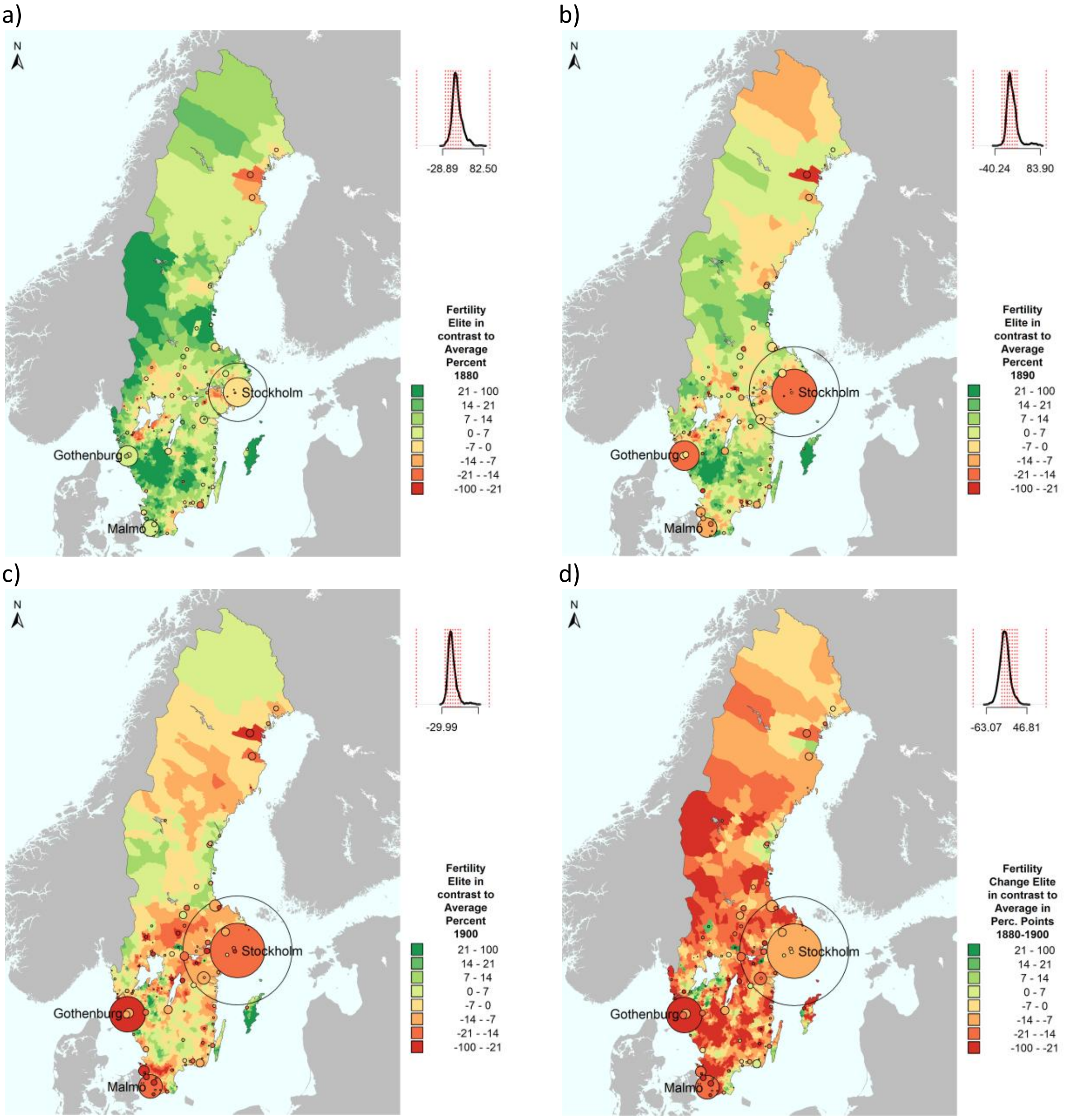
Source: Swedish Census 1880-1900, digitized by Swedish Archive, own calculations
Base Map: Swedish Parish Map by Swedish Archive, MPIDR Population History GIS Collection

If we look at the pattern for the elite (Figure 1b), however, we see a very different picture. In almost all areas of Sweden elite women experienced a decline independent of whether the area was remote or central. However, the areas with the highest declines are concentrated in the southern half of Sweden, while the north experienced in comparison lower declines. In the case of the elite, all three big cities including Gothenburg experienced drastic declines. The

[6] With regard to Malmö it is important to note that it is located close to the Danish capital of Copenhagen, which was at the end of the 19th century the biggest city in Scandinavia. Copenhagen entered the period of drastic fertility decline around 1880 (Coale and Watkins 1986).

pattern of the elite suggests that ideas on the advantages of reducing fertility and technologies to prevent conceptions or births had at that period already spread to virtually all parts of Sweden.

Fig. 2: Child Women Ratios (Elite vs. Overall)



Source: Swedish Census 1880-1900, digitized by Swedish Archive, own calculations
Base Map: Swedish Parish Map by Swedish Archive, MPIDR Population History GIS Collection

The spatial fertility change pattern of the farmers resembles closely the averages for all social groups, which is not surprising as farmers were the predominant social class in rural areas which covered most of Sweden at that time. The situation is different for our third social class category that comprises all other classes but the elite and the farmers. Women of this group actually experienced in the period 1880 to 1900 in many parts of Sweden increases in the CWR. This even includes the city of Gothenburg and the city of Stockholm in the period 1880-1890 (see below). However, in both cities the trend was reversed in the period 1890-1900, with the decline in Stockholm being so strong that the 1900 levels submerged the 1880 levels. Malmö registered declines in both sub-periods, but witnessed an acceleration in the decline after 1890.

Overall, the maps of Figure 1 provide the impression that the fertility trends varied substantially by social class in this early period of the fertility decline in Sweden. This provides support to the communication communities hypothesis by Szreter (1996). The social-class differences in the onset of the fertility decline also had implications for the socio-economic gradient in fertility outcomes. In Figure 2, we map the percentage to which the CWR of the elite was above or below the level registered for all social groups in a parish. In 1880, in vast parts of Sweden the elite group had still higher CWRs compared to the average levels observed in an area. This also included the elites living in the cities of Gothenburg and Malmö. In Stockholm the gradient was negative, but the difference to the average was not big. The net fertility advantage of the elite was in some parts of Sweden more than 20 percentage points above the one observed in average. This included Gotland, the Bible belt area in southern Sweden east of Gothenburg and the areas in the northern part of central Sweden. This changed drastically over the short period between 1880 and 1900. Between 1880 and 1890 we see particularly changes in the two biggest cities Stockholm and Gothenburg, where in 1900 the fertility outcomes of the elite have become substantially lower, compared to the average. By 1900 almost all bigger cities display a negative socio-economic gradient in child women ratios, and also among the more peripheral areas there are only a small number of areas left which display a clear positive gradient in child women ratio. The latter group includes large part of the island of Gotland southeast of Stockholm. This is insofar interesting, as Gotland is in the literature considered to be the Swedish region that experienced the fertility decline first. According to the Princeton European Fertility Project Gotland already entered the fertility transition in the decade 1850-1860, marking it as the vanguard region in Northern Europe (Coale and Watkins 1986: Map 2.1). We will come back to this in the discussion section.

Regression results

Table 2 shows estimations of the OLS models. Before turning to the main effects, it can be noted that the effects of the bio-demographic controls are in the expected directions. As shown in Table 2, the age of women has the predicted effect on net fertility, being highest in the age group 25-29 and lowest at the highest ages. Age heterogamy also has an impact with higher net fertility in woman-older couples and lower fertility in unions where the man is more than two years older than the wife.

(Table 2)

The effect of migrant status is captured by the distance from the parish of birth. According to the estimated coefficients, women living within 10 kilometres from their birth place tend to have a lower net fertility. The magnitude of the effects are not big, but the results nonetheless suggest that migration, if anything, is related to higher and not lower fertility. However it is important to note that this covariate does not take into account recent migration events, since it just measures the life-time net migration distance, referring to the birth places. As a matter of fact, this limit could similarly affect the covariate based on the proportion of long distance migrants at parish level. Nonetheless women living in communities with high proportions of migrants have lower net fertility than women in other communities. An unexpected outcome is that lower net fertility is also registered in parishes with a low rate of migrants in 1880 and 1890. This coefficient is not significant in the model on 1900.

Considering the other contextual variables, there is a clear negative association between net fertility and population density. As can be seen in Table 2, the magnitude of this effect increases between 1880 and 1900 which fits with our theoretical considerations. Looking at the number of teachers per 100 school children aged 7-14, there is an inverse U-shaped association in 1880, with women living in medium-level communities having the highest fertility. In 1890 and 1900, however, we find the expected negative association, implying lower net fertility for women in communities with a stronger educational orientation. Higher proportions of the labour force employed in industry are also associated with lower net fertility. Overall, these community-level variables show the expected association with net fertility, giving some support for our theoretical predictions. It should be noted, however, that these effects are quite small, whereas the magnitude of individual-level indicators, on the other hand, is quite sizable.

Taking into account the SES effect, in 1880 skilled and unskilled workers have a higher number of children per woman, since their coefficients are respectively equal to 0.049 and 0.057. Net fertility of farmers is almost on the same level of elite (reference category), registering a 0.009 coefficient. Even if the unskilled workers' coefficient is not significant, its value (0.005) is close to the one of the highest SES group (see Table 2). The models show that socioeconomic differences in net fertility appear more and more remarkable in the next two censuses. The upper class registers a decreasing number of children, confirming their role as forerunners. In 1890, coefficients of skilled and lower skilled workers are about 0.085 and 0.096 whereas the ones of farmers and unskilled labourers range between 0.050 and 0.059. Ten years later in 1900, elite groups' fertility further decreases, since coefficients of the remaining socioeconomic groups are systematically higher than 0.09. The highest effect is observed for lower skilled workers (0.116) that can be considered as the laggards in the fertility decline. According to these results, during the transition, fertility differences by socioeconomic status increased. The individual measure of women's employment showed negative associations with net fertility (see Table 1) in all three censuses. Similarly, the community level measure of female labour force participation displays a clear negative association in 1900. However in 1880 and 1890, women living in parishes with a low rate of female labour force participation (bottom quartile) have slightly lower net-fertility rates than women in medium labour force participation communities.

(Table 3.1)

In order to visualize the association between net fertility and distance from big Swedish towns, we calculate the predicted number of children per married woman (marital CWR) by distance from the three biggest Swedish towns in the reference categories. Figure 3.a displays these predicted values based on the coefficients reported in Table 2. In each census, we can observe the lowest predicted marital CWR in Stockholm and its area, whereas the highest one are seen in Gothenburg region and remote zones that are located more than 100 km away from any of the three biggest cities. The centre of Malmö and its surrounding area have intermediate values. In 1880, the geographical variation of the CWRs' is more limited than in 1890 and 1900. In 1880, the difference between the highest marital CWR of Gothenburg (1.287) and the lowest one of Stockholm (1.136) is equal to 0.151. This difference increases by 45 % to 0.220 in 1900. This finding supports the idea that fertility decline was a diffusion process with a clear geographic dimension. However, it is worth to assess if this is true for each socioeconomic group. So we estimate again the same regression model for three separated macro socio economic groups: elite (HISCLASS 1-6), farmers (HC 8) and the other groups (HC 7, 9-12). We report this estimates in Table 3.1. Before looking at the effect of the distance from the big Swedish towns, something can be said about the other variables. The effects of the bio-demographic controls, woman employment and distance from parish of birth are confirmed. The inverse U-shape relationship between net fertility and female labour force rate is now only visible for the farmers, whereas it is clearly negative for the elite and the other groups. In 1880, education rate has a negative effect on net fertility of elite, whereas farmers and others still show the inverse U-shape relationship. Farmers are also less sensitive to the population density effects, since the coefficients of this covariate are either not significant or exhibit unexpected directions in the different censuses.

(Table 3.2)

More interesting is to look at the differential effects of the distance from the biggest town by socioeconomic status. Also here we calculate the predicted number of children per married woman by macro-socioeconomic groups and by distance from the big Swedish towns in the reference categories. Figures 3.b, c and d plot respectively the predicted values of elite, others and farmers based on the models estimated in Table 3.2. The tendencies of the other groups (Figure 3.c) are most similar to the ones we observed for the entire population, without distinguish by SES (Figure 3.a). As can be seen in Figure 3.c, there is a relative low geographical variation in 1880 and 1890, whereas geographical differences between the three considered areas increase in 1900. The range between the highest and lowest predicted marital CWR in 1880, 1890 and 1900 are respectively 0.138, 0.172 and 0.235. Stockholm centre and its zone confirm to have the lowest net fertility levels. The elite group exhibits a more limited geographical variation (Figure 3.b), since the differences between highest and lowest CWR values in 1880, 1890 and 1900 are respectively equal to 0.180, 0.125 and 0.193. On the contrary, farmers register the highest geographical gradient (see Figure 3.d). It is worthwhile to note that, in remote non-urban parishes and Gothenburg’s area, CWRs of farmers in 1890 and 1900 are higher than the ones in 1880 (Figure 3.d). This is also partially true for other groups. According to these results, while elite was experiencing a progressive and irreversible fertility decline, in some areas of Sweden other social groups experienced increases in the number of surviving children.

Fig. 3.a. Predicted Child-Woman Ratios by Distance from Big Towns - Full Model

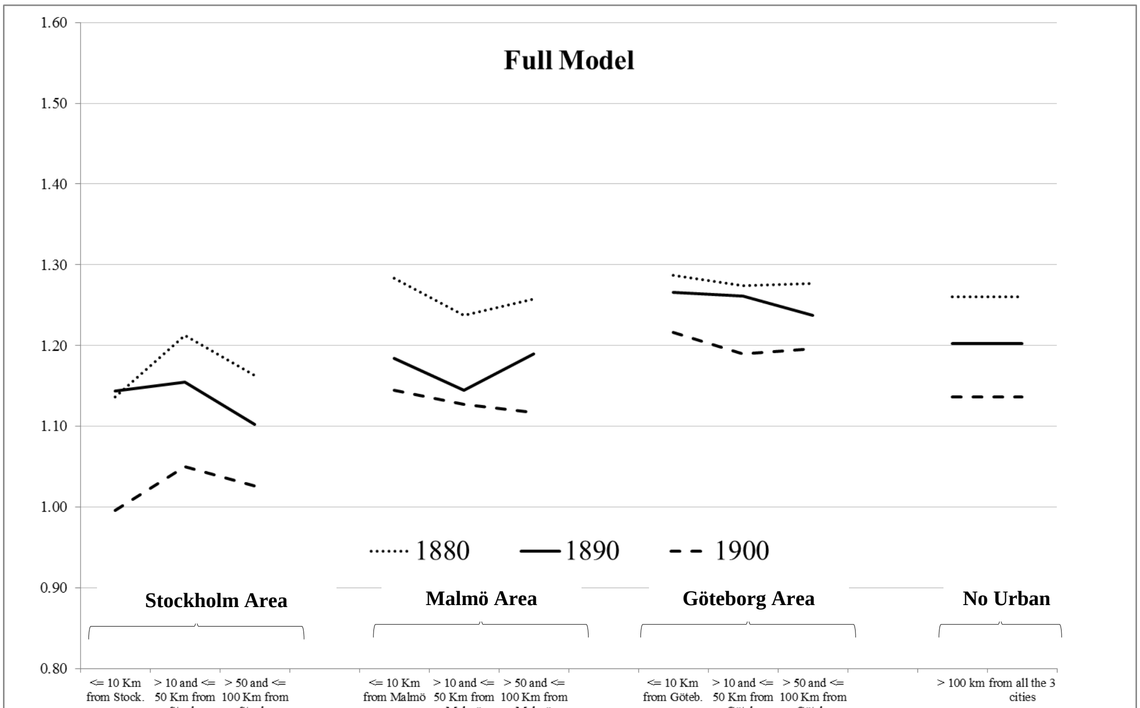


Fig. 3.b. Predicted Child-Woman Ratios by Distance from Big Towns - Elite

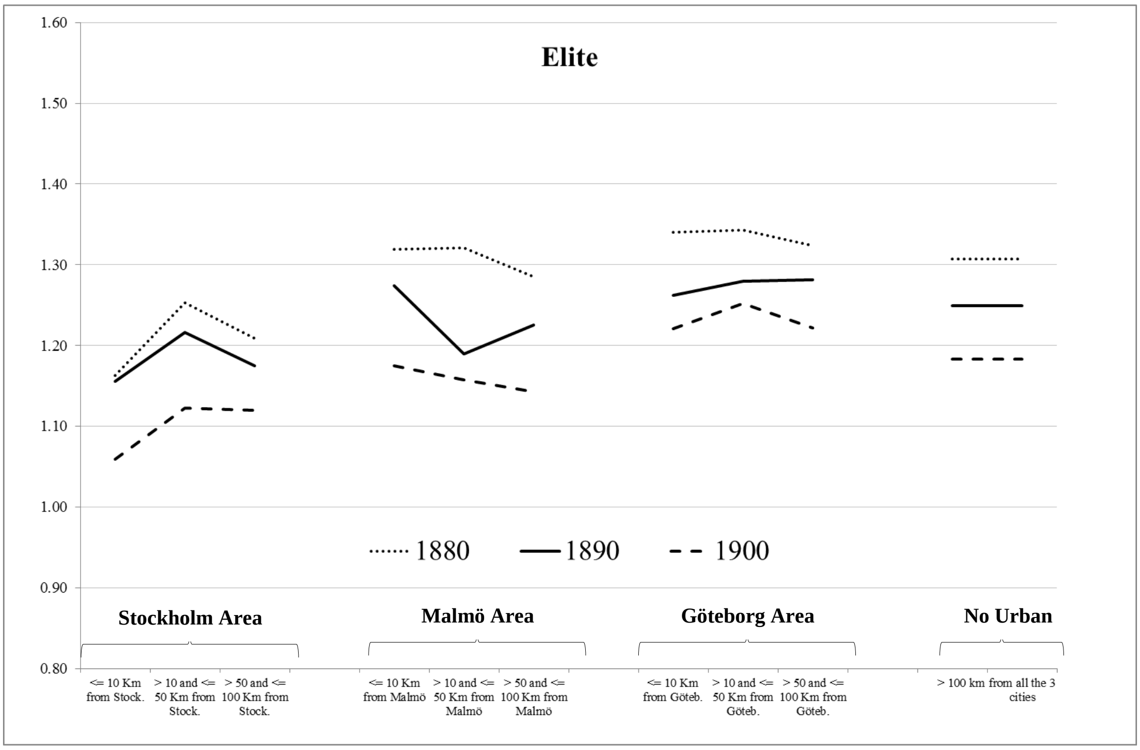


Fig. 3.c. Predicted Child-Woman Ratios by Distance from Big Towns - Other Groups

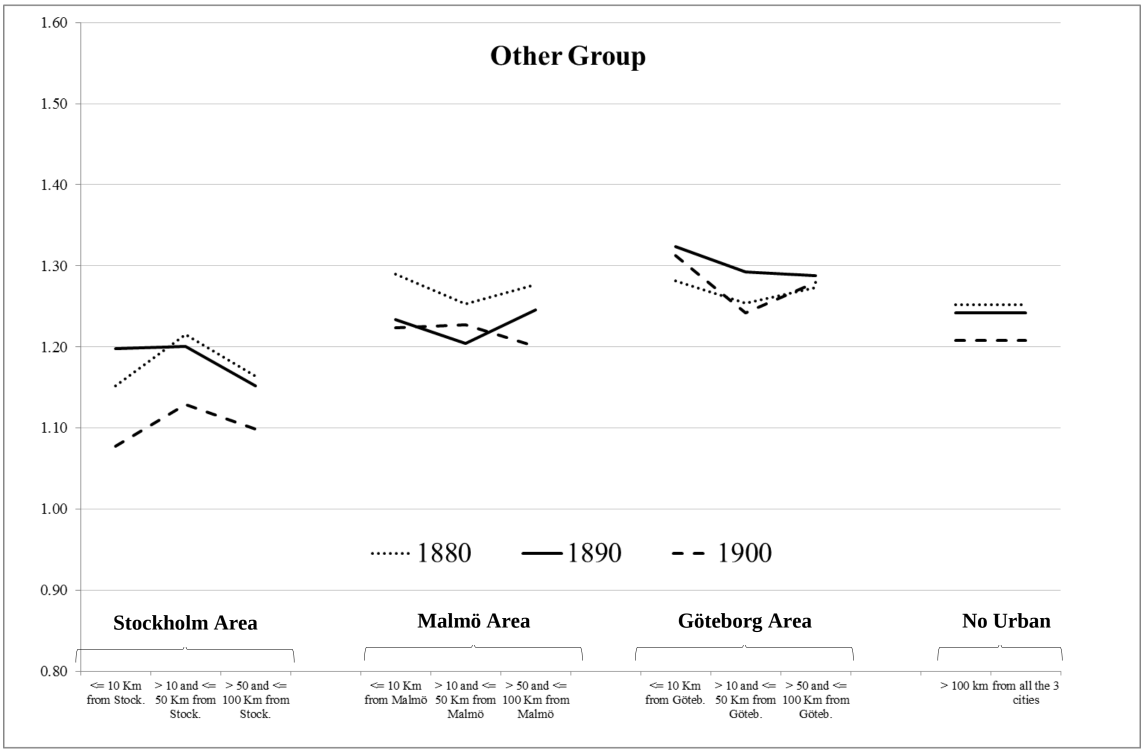
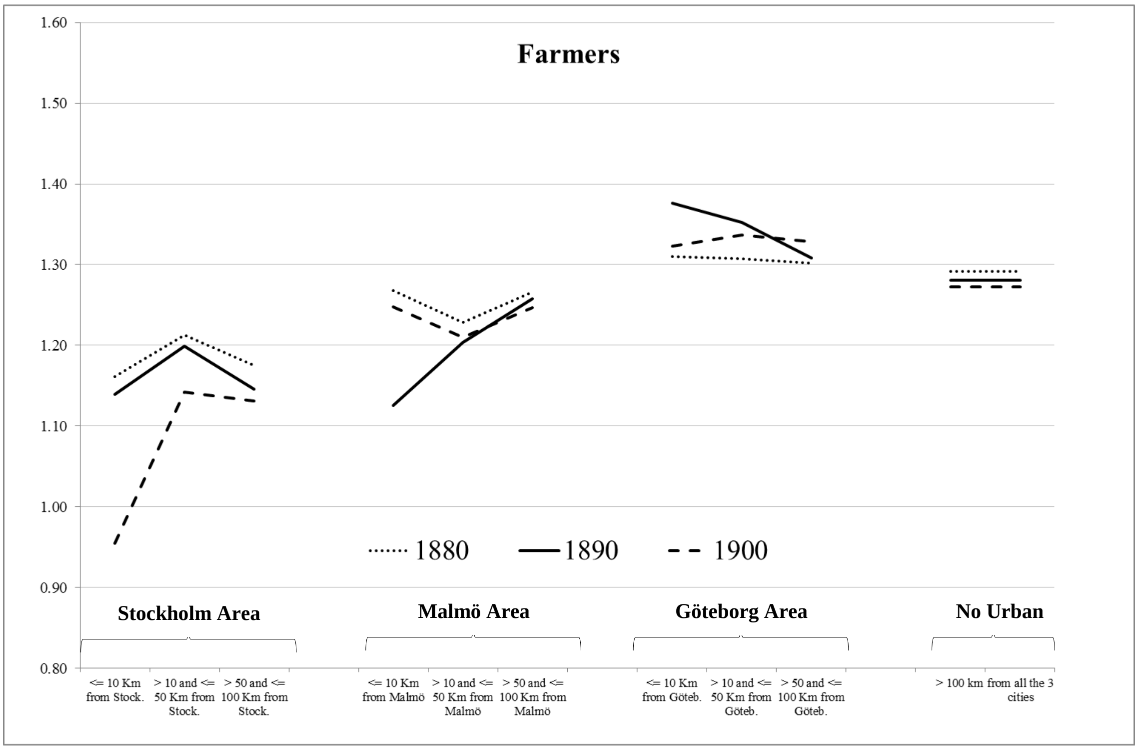


Fig. 3.d. Predicted Child-Woman Ratios by Distance from Big Towns - Farmers

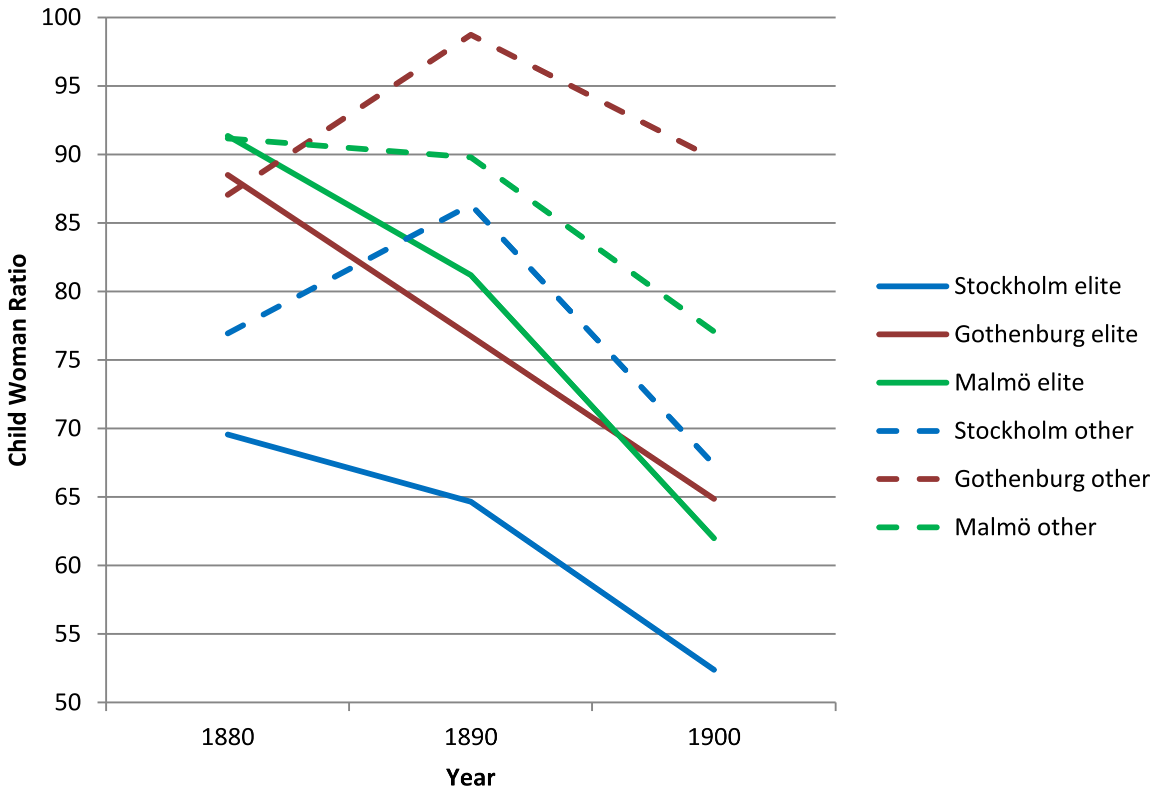


Finally, we also assess to what extent the elite group could influence net fertility levels of the other groups. So we estimate another regression model only taking into account farmers and the other groups with the exception of elite. This new model further includes the marital CWR of the elite group. The elite CWR effects are reported in Table 3.2. According to these results, there is a significant positive relationship between the net fertility of elite and the one of the farmers and other groups. Women living in parish with lower elite CWRs tend to have a lower number of children.

Discussion

The preliminary results of our analysis suggest that, at least in this initial phase of the fertility transition in Sweden, social distance between individuals seems to be more relevant for the adaption of contraceptive behavior compared to absolute spatial distance. As descriptive findings and regression models have shown, the elite seems to be the vanguard population in the fertility decline in Sweden. The diffusion and adaptation of contraceptive behavior in this social group occurs to be little constrained by spatial distance. Already in this very initial phase of the decline the CWR of elite women is falling drastically almost independent on whether they live in big urban centers or in very remote areas of Sweden. Diffusion of this new behavior across social groups living in the same location seems to occur on the other hand in most cases with much smaller intensity. In many locations of Sweden we actually witness that the net fertility of some social classes was still rising, while the net fertility of the elite was already falling. With the exception of the elite, marital CWRs predicted by our regression models actually increased in some remote regions and in Gothenburg's area in this period. Even in the two biggest cities we witness at least in the period 1880-1890 still fertility increases in our "other" social group including all individuals but the elite and the farmers (see Figure 4). As a result of this lag in the onset of the fertility decline by social class, we see differences between the fertility outcomes of the elite and other social groups diverging across almost all Sweden, with a particular focus on the big cities. Mapping net fertility by SES and controlling in regression models for several individual and contextual factors, we demonstrated that the areas in which non-elite groups experience an early decline are also much more clustered on big urban centers (mainly Stockholm and Malmö) and important transportation corridors.

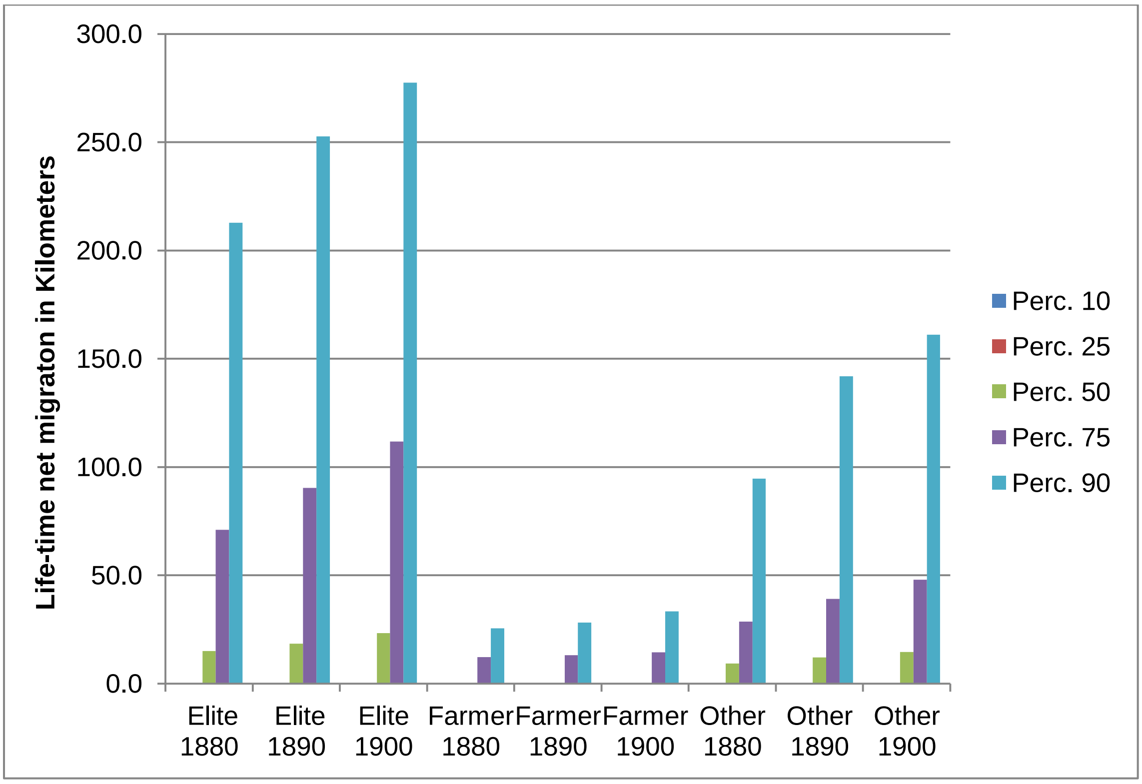
Fig. 4 Fertility Changes in the Centers of the three Biggest Cities by Social Status



Source: Swedish Census 1880-1900, digitized by Swedish Archive, own calculations

Our findings that the fertility trends differ substantially by social class in almost all parishes of Sweden at that time independent of whether they were big cities or remote rural areas provides support for Szreter's (1996) communication community hypothesis. Unfortunately data constraints do not allow us to test directly, whether the fast spread of the fertility decline among the elite across all of Sweden can be linked to their social networks covering larger distances. But as a crude proxy we can use information on the life-time net migration pattern of persons, assuming that they might still have kin-links or other social contacts to the places in which they were born. These support the view that social networks of the elite were spanning much larger distances compared to those of farmers and other social groups (see Figure 5). Also our outcomes for the life-time net-migration variables provide some support in this direction. In 1880 living far away from the parish of birth is for all social groups associated with higher fertility outcomes, which might be linked to healthy migrant effects or migration contributing to a better access to assets. However, until 1900, the positive gradient weakens for our full models (Table 2), while among the elite it actually even turns negative (see Table 3.1). This could be interpreted as positive (selection) effects of long-distance migration on fertility being increasingly being outweighed by negative effects such as being more likely to be exposed to information on benefits of reducing fertility as a result of larger social networks. However, the evidence presented here is rather weak and would require further validation with better information on social networks of individuals at that time.

Fig. 5 Life-time net migration pattern by social class (women 15-54)



Source: Swedish Census 1880-1900, digitized by Swedish Archive, own calculations

The life time net-migration pattern as displayed in Figure 4 also provides support for our assumption that a higher share of elite women was living far away from their birth parish. This might have resulted in large shares of the elite women not being deeply embedded in local intergenerational kinship and community networks, whose social control influence might have slowed down the pace of fertility control diffusion. This might have contributed to elite women more willing to adapt fertility control strategies.

Related to the readiness concept, which implies that for an adoption of this new behavior the benefits have to be obvious for a person, one might argue that elite persons might be more likely not only to consider changes in local conditions but also changes in conditions in far-distant places in their fertility choices. If e.g. education and social mobility opportunities in Stockholm change, this might also be relevant for elite persons living in far distant places, as they might e.g. be able to finance their children a good education to use the new career opportunities in big cities. However, with regard to this argumentation the question arises whether the quality-quantity tradeoff was really so relevant for the elite, as they were the social group which was potentially least constraint by limitations in financial resources. Perhaps, the personal advantages of having less work burden with a fewer number of children was more relevant in the decisions of elite women.

As part of a structural argumentation one might argue that the elite was experiencing the decline first, as they were also those that experienced the mortality transition faster (Bengtsson and Dribe 2010). We do not have information on mortality trends by social class for this period for the whole country, but it is important to point out that in the case of Sweden there is a big time lag between the onset of the mortality transition and the subsequent fertility transition by several decades (see e.g. Dyson 2011). By 1880, infant mortality rates were already very low in virtually all parts of Sweden, making it unlikely that we could observe strong variation by social class. Thus we consider the impact of socio-economic differentials in mortality on the decline pattern by social class to be rather low[7].

So do our findings imply that local structural economic conditions are not very relevant for the decline, as at least among the elite the decline spread fast even to very peripheral areas? It is at least interesting to see that e.g. in Stockholm and Gothenburg the timing of the onset of the fertility decline differs by social class (see Figure 4). This suggests that it is not possible to link the onset to one cross-sectional event such as a policy reform limiting child labor or changes in duration of schooling. Nevertheless, once the fertility decline starts or diffuses into a social class it seems to be most intense in the highly urbanized and economically developed areas, as can also be seen in the contextual coefficients of our models. But most of the contextual economic coefficients have much lower effect sizes compared to individual-level characteristics such as socio-economic status.

Our descriptive results might also improve our understanding on the puzzling case of Gotland. According to the 10%-threshold rule applied by the Princeton Fertility Project, Gotland is considered the vanguard region in the Swedish fertility decline. It experienced substantial fertility decline in the mid 19th century and had by 1880 the lowest child women ratios registered in all Sweden (not shown in this paper). In addition, it exhibited an unusual urban-rural gradient with the city of Visby registering higher CWRs than the surrounding areas. The evidence that Gotland remained to have a positive socio-economic gradient in fertility outcomes at least until 1900 as well as the negative urban-rural gradient raises doubts that the fertility decline that Gotland experienced in the mid 19th century was already the start of the fertility transition in Sweden. If the fertility decline in Gotland in the mid 19th century is indeed not linked to the fertility transition, then Stockholm as the biggest city would be the region that first experienced the transition.

Our findings have a number of limitations. One is the short time period of 20 years covered in our analysis. Thus, it is difficult to assess to what extent our first cross-section 1880 can be considered to represent pre-transitional Sweden. A number of studies have shown that societies experience prior to the decline a period in which fertility was increasing (Dyson and Murphy 1985). As our data suggest that there is a time lag in the onset of the decline by social class, this might imply that while the non-elite groups were in 1880-1890 still in this pre-transition period with rising (net) fertility rates, the elite might already have gone through this period prior to 1880. Thus the relative high fertility outcomes which we register for the elite in 1880 might to some degree result from these pre-decline increases. However, our finding that the elite had at least in some locations and areas of Sweden above-average fertility outcomes prior to the fertility transition are in line with theoretical considerations and empirical evidence presented by Skirbekk (2008). Other limitations include that with regard to the migration histories of the individuals we have just information on the place of birth and place of residence at the time of the census, and no data how long a person lives in a location, which does not allow us to look in more detail in the effect of recent migratory events on fertility outcomes.

[7] It is also worth to note that by using the child women ratio we do to some degree already control for socio-economic differences in infant mortality

Conclusion and Outlook

Our preliminary results suggest that in the initial phase of the transition social distance was more relevant for the adaptation of fertility control behaviour compared to spatial distance. We confirm Szreter's (1996) notion for Britain, that the fertility decline did not occur in one wave, but in several waves differentiated by social class. The adaption of fertility control behaviour by the elite seems to a much lesser degree be constrained by spatial distance compared to other groups. Thus, the nebula-like diffusion pattern described by Hägerstrand (1965) is much more pronounced among the lower social strata. With this finding we contribute to a growing body of evidence that the impact of spatial context on demographic changes and outcomes can differ substantially by social class (see e.g. Andreev et al. 2010; Harper 2013) with the higher classes being least constrained by contextual conditions. As a next step we intend to move from our cross-sectional models to a dynamic modelling framework. This will hopefully allow us to further improve our insights on the interplay between individuals and socioeconomic contexts in the diffusion of the fertility decline over time.

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Table 1.1. Distribution of covariates (%).

	1880	1890	1900
Age of woman			
15-19	0.4	0.4	0.4
20-24	6.0	5.4	6.5
25-29	13.5	14.1	13.6
30-34	16.8	17.9	15.9
35-39	17.8	17.3	18.2
40-44	16.2	16.2	17.4
45-49	15.7	15.4	15.0
50-54	13.7	13.2	13.0
Age difference btw spouses			
Wife older	27.9	26.9	26.0
Husband 0-2 older	21.3	22.0	22.7
Husband 3-6 older	25.2	25.6	26.3
Husband>6 older	25.6	25.6	24.9
Children>4 years in hh			
No	30.9	29.9	29.6
Yes	69.1	70.1	70.4
Household status			
Head family	96.0	96.2	96.9
Lodger	4.0	3.8	3.1
SES			
Elite	10.2	11.9	14.0
Skilled Workers	9.4	11.2	13.0
Farmers	41.2	37.5	32.4
Lower Skilled Workers	8.2	10.8	13.7
Unskilled Workers	24.2	23.1	21.7
NA	6.9	5.5	5.1
Woman employed			
No	99.6	99.5	99.4
Yes	0.4	0.5	0.6
Distance from Parish of birth			
<= 10 Km	58.4	53.9	49.4
> 10 and <= 50 Km	28.8	29.5	30.2
> 50 Km	12.8	16.6	20.4
Female Labor Force Rate			
Low (1st quartile)	25.3	24.1	22.0
Medium (2nd and 3rd quartiles)	48.0	47.2	45.1
High (4th quartile)	26.7	28.8	32.9
Education Rate			
Low (1st quartile)	21.6	22.3	22.86
Medium (2nd and 3rd quartiles)	59.3	55.4	58.91
High (4th quartile)	19.2	22.3	18.23
Prop. Employed in industry			
Low (1st quartile)	19.3	17.5	15.9
Medium (2nd and 3rd quartiles)	43.9	40.3	36.6
High (4th quartile)	36.8	42.2	47.5

Prop. of Migrants more than 100 Km			
Low (1st quartile)	17.2	14.8	13.2
Medium (2nd and 3rd quartiles)	47.1	44.4	40.0
High (4th quartile)	35.8	40.9	46.8
Population Density			
<= 50	76.4	71.59	67.1
> 50 and <= 100	9.3	8.36	8.4
> 100 and <= 1000	7.3	9.81	12.2
> 1000	7.1	10.25	12.2
Distance from Big Cities			
<= 10 Km from Stockholm	3.4	5.2	5.9
> 10 and <= 50 Km from Stockholm	2.2	2.2	2.3
> 50 and <= 100 Km from Stockholm	5.6	5.8	5.6
<= 10 Km from Malmö	1.3	1.5	1.9
> 10 and <= 50 Km from Malmö	4.9	4.6	4.6
> 50 and <= 100 Km from Malmö	6.1	6.1	5.8
<= 10 Km from Göteborg	2.0	2.8	3.2
> 10 and <= 50 Km from Göteborg	2.7	2.5	2.3
> 50 and <= 100 Km from Göteborg	7.2	6.5	6.3
> 100 km from all the 3 cities	64.6	62.9	62.0
N. cases	580,849	586,918	619,096

Source: Micro-level census data, SweCens, The Swedish National Archives.

Table 1.2. Mean number of children 0-4 (Child-woman ratios) by socioeconomic status.

	1880	**1890**	**1900**
SES			
Elite/upper middle class	0.87	0.82	0.73
Skilled Workers	0.93	0.93	0.87
Farmers	0.85	0.85	0.83
Lower Skilled Workers	1.00	1.02	0.97
Unskilled Workers	0.89	0.94	0.91
NA	0.75	0.73	0.74
Total	0.87	0.89	0.85

Table 2 - Regression model estimates for the number of children 0-4 per married women 15-54 Aged. Sweden: 1880, 1890 and 1900

	1880		1890		1900	
	coeff.	p. value	coeff.	p. value	coeff.	p. value
Age of woman						
15-19	-0.600	0.000	-0.585	0.000	-0.471	0.000
20-24	-0.210	0.000	-0.149	0.000	-0.097	0.000
25-29	0.056	0.000	0.081	0.000	0.122	0.000
30-34	ref.		ref.		ref.	
35-39	-0.208	0.000	-0.219	0.000	-0.221	0.000
40-44	-0.573	0.000	-0.587	0.000	-0.576	0.000
45-49	-1.119	0.000	-1.134	0.000	-1.101	0.000
50-54	-1.407	0.000	-1.401	0.000	-1.355	0.000
Age difference btw spouses						
Wife older	0.027	0.000	0.030	0.000	0.043	0.000
Husband 0-2 older	ref.		ref.		ref.	
Husband 3-6 older	-0.017	0.000	-0.028	0.000	-0.019	0.000
Husband>6 older	-0.082	0.000	-0.102	0.000	-0.082	0.000
Children>4 years in hh						
No	ref.		ref.		ref.	
Yes	0.255	0.000	0.272	0.000	0.253	0.000
Household status						
Head family						
Lodger	-0.168	0.000	-0.159	0.000	-0.173	0.000
SES						
Elite	ref.		ref.		ref.	
Skilled Workers	0.049	0.000	0.085	0.000	0.096	0.000
Farmers	0.009	0.012	0.050	0.000	0.090	0.000
Lower Skilled Workers	0.057	0.000	0.096	0.000	0.116	0.000
Unskilled Workers	0.005	0.201	0.059	0.000	0.087	0.000
NA	-0.019	0.000	0.006	0.313	0.043	0.000
Woman employed						
No	ref.		ref.		ref.	
Yes	-0.186	0.000	-0.175	0.000	-0.141	0.000
Distance from Parish of birth						
<= 10 Km	ref.		ref.		ref.	
> 10 and <= 50 Km	0.021	0.000	0.024	0.000	0.022	0.000
> 50 Km	0.049	0.000	0.035	0.000	0.013	0.000
Female Labor Force Rate						
Low	-0.002	0.409	-0.001	0.743	0.011	0.000
Medium	ref.		ref.		ref.	
High	-0.023	0.000	-0.019	0.000	-0.024	0.000
Education Rate						
Low	-0.024	0.000	0.011	0.000	0.024	0.000
Medium	ref.		ref.		ref.	
High	-0.026	0.000	-0.026	0.000	-0.032	0.000
Prop. Employed in industry						
Low	0.041	0.000	0.042	0.000	0.038	0.000
Medium	ref.		ref.		ref.	
High	-0.004	0.157	-0.017	0.000	-0.006	0.049

Prop. of Migrants >=100 Km						
Low	-0.014	0.000	-0.007	0.026	-0.004	0.205
Medium	ref.		ref.		ref.	
High	-0.064	0.000	-0.043	0.000	-0.042	0.000
Population Density						
<= 50	ref.		ref.		ref.	
> 50 and <= 100	-0.020	0.000	-0.007	0.115	-0.025	0.000
> 100 and <= 1000	-0.024	0.000	-0.018	0.000	-0.045	0.000
> 1000	-0.044	0.000	-0.052	0.000	-0.098	0.000
Distance from Big Cities						
<= 10 Km from Stockholm	ref.		ref.		ref.	
> 10 and <= 50 Km from Stockholm	0.077	0.000	0.011	0.311	0.054	0.000
> 50 and <= 100 Km from Stockholm	0.027	0.003	-0.042	0.000	0.030	0.000
<= 10 Km from Malmö	0.147	0.000	0.040	0.000	0.149	0.000
> 10 and <= 50 Km from Malmö	0.101	0.000	0.001	0.895	0.131	0.000
> 50 and <= 100 Km from Malmö	0.122	0.000	0.046	0.000	0.121	0.000
<= 10 Km from Göteborg	0.151	0.000	0.122	0.000	0.220	0.000
> 10 and <= 50 Km from Göteborg	0.138	0.000	0.117	0.000	0.194	0.000
> 50 and <= 100 Km from Göteborg	0.141	0.000	0.093	0.000	0.200	0.000
> 100 km from all the 3 cities	0.124	0.000	0.058	0.000	0.140	0.000
Constant	1.136	0.000	1.144	0.000	0.996	0.000
N. cases	580849		586918		619096	

Source: See Table 1.

Table 3.1 - Regression model estimates for the number of children 0-4 per married women 15-54 Aged for Elite, Farmers and Other groups. Sweden: 1880, 1890 and 1900

	1880						1890						1900					
	Elite		Other groups		Farmers		Elite		Other groups		Farmers		Elite		Other groups		Farmers	
	coeff.	p. value	coeff.	p. value	coeff.	p. value	coeff.	p. value	coeff.	p. value	coeff.	p. value	coeff.	p. value	coeff.	p. value	coeff.	p. value
Age of woman																		
15-19	-0.622	0.000	-0.541	0.000	-0.727	0.000	-0.677	0.000	-0.541	0.000	-0.700	0.000	-0.391	0.000	-0.443	0.000	-0.628	0.000
20-24	-0.234	0.000	-0.203	0.000	-0.208	0.000	-0.140	0.000	-0.144	0.000	-0.156	0.000	-0.123	0.000	-0.075	0.000	-0.130	0.000
25-29	0.075	0.000	0.044	0.000	0.075	0.000	0.100	0.000	0.072	0.000	0.098	0.000	0.123	0.000	0.126	0.000	0.128	0.000
30-34	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
35-39	-0.250	0.000	-0.192	0.000	-0.220	0.000	-0.262	0.000	-0.208	0.000	-0.225	0.000	-0.240	0.000	-0.217	0.000	-0.227	0.000
40-44	-0.650	0.000	-0.553	0.000	-0.581	0.000	-0.641	0.000	-0.565	0.000	-0.603	0.000	-0.607	0.000	-0.555	0.000	-0.605	0.000
45-49	-1.157	0.000	-1.096	0.000	-1.142	0.000	-1.120	0.000	-1.123	0.000	-1.159	0.000	-1.033	0.000	-1.079	0.000	-1.169	0.000
50-54	-1.400	0.000	-1.381	0.000	-1.443	0.000	-1.343	0.000	-1.386	0.000	-1.444	0.000	-1.232	0.000	-1.328	0.000	-1.447	0.000
Age difference btw spouses																		
Wife older	0.037	0.000	0.022	0.000	0.034	0.000	0.055	0.000	0.017	0.000	0.044	0.000	0.053	0.000	0.040	0.000	0.047	0.000
Husband 0-2 older	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
Husband 3-6 older	-0.035	0.001	-0.011	0.010	-0.024	0.000	-0.031	0.001	-0.022	0.000	-0.036	0.000	-0.033	0.000	-0.009	0.021	-0.033	0.000
Husband>6 older	-0.098	0.000	-0.078	0.000	-0.091	0.000	-0.136	0.000	-0.096	0.000	-0.103	0.000	-0.110	0.000	-0.066	0.000	-0.098	0.000
Children>4 years in hh																		
No	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
Yes	0.266	0.000	0.252	0.000	0.258	0.000	0.279	0.000	0.275	0.000	0.268	0.000	0.223	0.000	0.261	0.000	0.254	0.000
Household status																		
Head family	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
Lodger	-0.223	0.000	-0.194	0.000	-0.095	0.000	-0.121	0.000	-0.201	0.000	-0.099	0.000	-0.149	0.000	-0.208	0.000	-0.113	0.000
Woman employed																		
No	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
Yes	-0.165	0.000	-0.200	0.000	-0.137	0.004	-0.166	0.000	-0.188	0.000	-0.155	0.000	-0.142	0.000	-0.151	0.000	-0.133	0.000
Distance from Parish of birth																		
<= 10 Km	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
> 10 and <= 50 Km	0.026	0.002	0.016	0.000	0.025	0.000	0.016	0.044	0.020	0.000	0.025	0.000	0.030	0.000	0.017	0.000	0.023	0.000
> 50 Km	0.035	0.000	0.045	0.000	0.084	0.000	-0.006	0.382	0.038	0.000	0.068	0.000	-0.016	0.012	0.018	0.000	0.036	0.000
Female Labor Force Rate																		
Low	0.012	0.284	0.003	0.517	-0.009	0.014	0.026	0.005	0.000	0.948	-0.006	0.082	0.057	0.000	0.017	0.000	-0.003	0.521
Medium	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
High	-0.023	0.013	-0.024	0.000	-0.022	0.000	-0.023	0.008	-0.012	0.002	-0.026	0.000	-0.029	0.000	-0.017	0.000	-0.037	0.000

Education Rate																		
Low	-0.018	0.066	-0.023	0.000	-0.027	0.000	0.002	0.796	0.004	0.289	0.015	0.000	0.021	0.008	0.021	0.000	0.022	0.000
Medium	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
High	0.002	0.862	-0.015	0.000	-0.042	0.000	-0.009	0.321	-0.018	0.000	-0.041	0.000	-0.016	0.034	-0.021	0.000	-0.060	0.000
Prop. Employed in industry																		
Low	0.032	0.012	0.030	0.000	0.045	0.000	0.046	0.000	0.040	0.000	0.035	0.000	0.016	0.118	0.026	0.000	0.043	0.000
Medium	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
High	0.000	0.966	0.000	0.964	-0.005	0.236	-0.017	0.062	-0.011	0.004	-0.019	0.000	-0.015	0.070	-0.003	0.505	-0.002	0.628
Prop. of Migrants >= 100 Km																		
Low	-0.040	0.002	-0.005	0.362	-0.018	0.000	-0.028	0.020	0.001	0.839	-0.011	0.018	-0.027	0.014	-0.015	0.010	0.004	0.385
Medium	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
High	-0.092	0.000	-0.041	0.000	-0.082	0.000	-0.061	0.000	-0.028	0.000	-0.055	0.000	-0.057	0.000	-0.056	0.000	-0.027	0.000
Population Density																		
<= 50	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
> 50 and <= 100	-0.033	0.012	-0.025	0.000	0.001	0.901	0.006	0.653	0.001	0.810	-0.019	0.007	-0.019	0.085	-0.017	0.002	-0.037	0.000
> 100 and <= 1000	-0.036	0.006	-0.027	0.000	0.016	0.279	-0.028	0.016	-0.023	0.000	0.003	0.830	-0.046	0.000	-0.047	0.000	-0.027	0.070
> 1000	-0.038	0.058	-0.051	0.000	-0.070	0.145	-0.085	0.000	-0.052	0.000	-0.023	0.627	-0.117	0.000	-0.095	0.000	0.017	0.728
Distance from Big Cities																		
<= 10 Km from Stockholm	ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.		ref.	
> 10 and <= 50 Km from Stockholm	0.090	0.002	0.063	0.000	0.052	0.419	0.060	0.020	0.003	0.826	0.060	0.371	0.064	0.003	0.051	0.000	0.187	0.012
> 50 and <= 100 Km from Stockholm	0.046	0.038	0.012	0.270	0.014	0.818	0.019	0.339	-0.046	0.000	0.007	0.913	0.061	0.000	0.021	0.018	0.176	0.017
<= 10 Km from Malmö	0.156	0.000	0.138	0.000	0.107	0.117	0.118	0.000	0.036	0.002	-0.013	0.861	0.116	0.000	0.146	0.000	0.293	0.000
> 10 and <= 50 Km from Malmö	0.158	0.000	0.101	0.000	0.067	0.290	0.034	0.112	0.006	0.606	0.065	0.331	0.098	0.000	0.149	0.000	0.255	0.001
> 50 and <= 100 Km from Malmö	0.122	0.000	0.125	0.000	0.105	0.095	0.069	0.002	0.048	0.000	0.119	0.074	0.084	0.000	0.123	0.000	0.292	0.000
<= 10 Km from Göteborg	0.177	0.000	0.129	0.000	0.149	0.033	0.106	0.000	0.126	0.000	0.237	0.002	0.162	0.000	0.235	0.000	0.368	0.000
> 10 and <= 50 Km from Göteborg	0.180	0.000	0.102	0.000	0.146	0.021	0.124	0.000	0.094	0.000	0.213	0.001	0.193	0.000	0.164	0.000	0.382	0.000
> 50 and <= 100 Km from Göteborg	0.161	0.000	0.121	0.000	0.141	0.025	0.125	0.000	0.09	0.000	0.169	0.011	0.163	0.000	0.202	0.000	0.373	0.000
> 100 km from all the 3 cities	0.144	0.000	0.100	0.000	0.131	0.037	0.093	0.000	0.044	0.000	0.142	0.033	0.124	0.000	0.130	0.000	0.317	0.000
Constant	1.163	0.000	1.152	0.000	1.161	0.000	1.156	0.000	1.198	0.000	1.139	0.000	1.059	0.000	1.078	0.000	0.955	0.000
N. cases	59047		282534		239268		69971		296842		220105		86593		331914		200589	

Source: See Table 1.

Table 3.2 - Regression model estimates for the number of children 0-4 per married women 15-54 Aged for Farmers and Other groups. Sweden: 1880, 1890 and 1900

	1880				1890				1900			
	Other groups		Farmers		Other groups		Farmers		Other groups		Farmers	
	coeff.	p. value	coeff.	p. value	coeff.	p. value	coeff.	p. value	coeff.	p. value	coeff.	p. value
CWRs of Elite												
Low	-0.052	0.000	-0.079	0.000	-0.037	0.000	-0.043	0.000	-0.046	0.000	-0.045	0.000
Medium	ref.		ref.		ref.		ref.		ref.		ref.	
High	0.032	0.000	0.052	0.000	0.037	0.000	0.063	0.000	0.039	0.000	0.087	0.000
N. cases	282534		239268		296842		220105		331914		200589	

Source: See Table 1.

Note: Model controls for age of woman, age difference btw. spouses, presence of children over 4, household status (head family or lodger), woman employed, distance from parish of birth, female labour force rate, education rate, prop. employed in industry, prop. of migrants >= 100 Km, population density, distance from big cities