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Migrants and Diffusion of low Marital Fertility in Nineteenth Century Sart, Belgium[2]

Abstract

The relationship between the diffusion of people (i.e. migration) and the diffusion of fertility behavior in the nineteenth century has received scant attention in the literature. Using population registers compiled in the Historical Database of the Liège Region, covering the period of 1812 to 1900, we assess differences in fertility behavior between migrants and non-migrants within the context of Sart, Belgium. Using detailed information about the age at migration, we find that migrant couples to Sart during the periods from 1850 to 1874 and from 1875 to 1899 display a reduced risk of experiencing a conception. Considering the interest in social diffusion in contemporary fertility research, this work aims to shed light on the intersection between the movement of people and the diffusion of behavior.

Introduction

Notable geographic variation characterized the decline in nineteenth century European fertility. In France marital fertility levels dropped decisively (over ten percent) before 1830, while some southern European countries like Spain did not experience a similar decline until the first decade of the twentieth century. Ron Lesthaeghe's study on Belgium noted important regional differences in the pattern of fertility decline. This regional variation contributed to the debate on the underlying causes of fertility decline in Europe, contrasting socio-economic factors derived from the classical literature or cultural variables as emphasized in the findings of the Princeton European Fertility Project (EFP).[3]

Apart from regional variation, there was also important social diversification in the adoption of birth control. In recent fertility studies the focus has shifted towards social diffusion of neo-Malthusian fertility behavior, characterizing the spread of reproductive norms and habits through the population. In this article we focus on the fertility behavior of mobile elements in Belgian society, namely migrants. We assess whether receiving populations differ in terms of marital fertility behavior from migrants, accounting for both partners in the marriage.[4]

Previous Research on Migration and Fertility

To our knowledge little to no research has considered migrant fertility in historical European populations. One explanation is that records of migration were often poorly maintained, resulting in a limited historical record. For the nineteenth century some sources, in particular population registers, provide detail about in- or out-migration to/from a fixed geographical unit, but they are only available in a handful of countries (e.g. Belgium, Italy, the Netherlands and Sweden). A second explanation is methodological. For some decades, the dominant method to study fertility behavior was family reconstitution. This method omitted people who were born, got married or died outside the village of interest. As a result, conclusions about the fertility behavior of a local population were made by measuring only the behavior of the most stable segment of that population.[5]

Despite these data and methodological limitations, the few studies that have linked migration and fertility have come to mixed conclusions. In some cases immigrants appeared to have lower fertility than natives. Studying the German town Würzburg, Allan Sharlin argued that migration flows to early modern cities contributed to a negative natural balance because immigrants had lower fertility than natives and often remained unwed. Similar results were found for nineteenth century Verviers, Belgium and Bremen, Germany. In the German

case, migrants were found to have longer birth intervals than natives. However, lower fertility was not always associated with migration. In nineteenth century Geneva, Switzerland, immigrant women tended to have higher fertility rates than the native born, linking female migration to increased population growth. That said, significant differences were not always found. In the case of the Belgian town of Charleroi during the nineteenth century, migrant reproductive behavior converged with that of the native born and the fertility decline had a similar intensity in both groups.[6]

Linking the Diffusion of Ideas to the Diffusion of People

Despite, or perhaps because of the methodological and theoretical difficulties and the mixed findings in the literature, it is important to take focus on the relation between migration and fertility. From a theoretical perspective, it is plausible that the geographic spread of fertility behavior is related to the increased mobility of people in nineteenth century Europe. Previous research has shown the marital patterns of migrants, a fundamental constraint to nineteenth century fertility, to be distinct from the native born. Recent migration studies show that migration was usually not definitive and migrants maintain social networks with their household and community of origin. Therefore, the increase of migration as a whole and of temporary movements in particular in the second half of the nineteenth century resulted in sustained links between rural and urban populations.

Of the small number of studies carried out so far on the relation between migration and fertility, the majority focused on urban or industrialized localities – centers of profound socio-economic change. Most of this work suggested that migrants who moved from a traditional place (high fertility) to a modern area (low fertility) tended to adapt to their new setting after initial differences in fertility. However, Jan Van Bavel's research on the provincial town of Leuven on the contrary suggests that those who moved from a modern to a traditional area were unlikely to change their behavior. Although some of the variation in fertility between migrants could be explained by the characteristics of the sending context, many questions remain.[7]

Michel Oris and Thierry Eggerickx, considering two industrials centers in French speaking Belgium (Tilleur and Charleroi), suggested that Flemish rural migrants had the highest fertility during the initial stages of Belgian fertility decline, although the results for other migrant categories were mixed. Other work, which considered the language of origin, suggested that those who originally spoke French had lower fertility than women who did not. The impact of migration as a factor produced no clear results in the French speaking rural

region of Herve. In fact, the opposite was true. Migrant women had significantly lower fertility, independent of their particular origin – language or otherwise. Clearly, the relationship between migration and fertility is not entirely straightforward. [8]

Hypotheses

Although scant, previous work did suggest a number of mechanisms by which migration could plausibly influence fertility. These were generally divided into three concepts – disruption, isolation, and selection. Although conceptually distinct, each of these pathways could lead to an expected lower fertility for migrants relative to women born in the context of reception.

To begin with, migration has often been linked with a postponement of childbirth due to psychological and practical reasons, broadly termed a process of disruption. Although this is likely to be temporary, it does predict lower short-term risk of pregnancy. Migration is also related to two longer-term mechanisms – isolation and selection. Firstly, migrants are assumed to be more isolated than natives who plausibly enjoy a more established social network. The fact that immigrants usually have a higher age at marriage than natives is often perceived as indicative of the difficulties foreigners have to integrate into the new environment. But even long term and relatively settled immigrants may experience the effects of a smaller kin network than natives. This is particularly relevant for nineteenth century Sart. Catherine Capron has shown that in this village some lineages were likely to move away, while others largely remained in place. A substantial part the natives of Sart belonged to stable extended family networks. The lack of such a web of relatives may negatively affect a couple's fertility decisions given the increased burden of responsibility on the relatively isolated migrant parent.[9]

A second mechanism relates to the selection of individuals with particular characteristics into the migration process. This selection may be based on visible features such as age and occupation – which we can observe – but also on a variety of unobserved motivations related to preferences concerning secularization and independence. For example, in eighteenth century Rouen and surroundings, migrants have higher levels of literacy than stayers. Migrants are often regarded as being more open to innovation and change. As a consequence, they are considered to be more receptive to the new ideas regarding fertility control that surfaced around the middle of the nineteenth century in most European countries. These inclinations may be amplified by the spatial distance from the relatively more traditional the place of origin.[10]

Given these mechanisms, which are distinct, but can predict lower fertility for migrants relative to the native born, we analyze differences in fertility behavior between migrants and natives in a particular local context – Sart, Belgium. It is important to note that although the literature does suggest that the disruptive and isolating nature of migration and the process of selection into migration can lead to lower fertility, there are alternative potential trajectories. Specifically, the immediate disruption of the migration event could lead to a recovery of fertility subsequent to settling in a new context, which could theoretically lead to increased fertility at older ages. Similarly, the effect of isolation could wane as a migrant becomes accustomed to a new context, which could also lead to fertility recovery. In addition, the sending and receiving context could factor into the observed fertility differences, particularly if selection is pertinent. Specifically, if the context of origin is characterized by higher fertility relative to the context of destination, then a migrant could plausibly have higher relative fertility despite having lower fertility in the context of origin. There is nothing about our analysis that prevents these patterns from emerging, but we feel that the general direction of the theoretical literature leads to a hypothesis that migration has a negative relationship with fertility.[11]

In addition, we consider the migration history of both the husband and wife. Incorporating the migrant status of the husband allows us to determine differences in fertility behavior depending on whether only one or both spouses are migrants. The effect of migration on fertility, when the selection mechanism is a play, could be the strongest when both marriage partners are immigrants. These partners would both be carrying fertility behavior from the context of origin and would be insulated to a greater extent from the fertility context of destination. However, dual-migrant marriages could also be more protected from the disruptive and isolating component of migration, suggesting that the theoretical effect of two migrant partners on fertility is not entirely clear.

Since both the selection and the isolation perspective build upon the idea of fertility as a process of conscious decision-making, we predict that the impact of migration will be significant only for periods after 1850, as there is no evidence of effective birth control prior to 1850 in most Belgian regions. In summary, we hypothesize that migrants will demonstrate a significantly lower risk of conception relative to those born in Sart, Belgium. We expect this to be particularly true when both partners are migrants.[12]

Context: Sart, Belgium

Although Belgium experienced a dramatic decline in national crude birth rates and marital fertility levels around 1880, research has noted non-trivial differences between Dutch speaking Flanders and French speaking Wallonia. In some Walloon districts marital fertility (I_g) fell below 0.7 before 1880, while the first Flemish districts that reached this level were the urban centers Ghent and Antwerp in 1900. A consistent trend was the more rapid shift towards fertility control in urban areas relative to rural districts. Urban/rural differences were however less notable in Wallonia.[13]

By focusing on a less urban context, Sart, we move beyond a previous focus on fertility change in an industrializing context. Sart was a sparsely populated and relatively poor municipality in the province of Liège in the Belgian Ardennes (French-speaking Wallonia). In the surrounding area industrialization was booming from the middle of the nineteenth century onwards. Verviers, less than 10km away, developed into and industrial textile center and Liège, about 30km away, became a center of mining and steel. This relatively rural context coupled with proximate industrializing centers, provides a unique opportunity to compare the fertility of natives with a varied inflow of migrants. Nineteenth century Sart furthermore exemplified the Malthusian *European marriage pattern*, with relatively high average age at first marriage and large proportions of people never married. Based on different estimation methods, the average age at first marriage for women varied between 26.9 and 28.3 in the period 1812-1899. This tendency was relatively stable throughout the entire time span. At the age of fifty between 11.8 and 19.6 percent of all women and 14 to 22.8 percent of all men were not married. This restrictive nuptiality drastically affected fertility: the total fertility rate was only 4.9, whereas the total marital fertility rate was 9.2. Nevertheless, the natural balance in Sart remained positive, resulting in an intense outmigration in the second half of the nineteenth century.[14]

Data: Historical Database of the Liège Region

To compare migrant and native fertility behavior in Sart, Belgium, we employ data from the Historical Database of the Liège Region. This database was constructed under the supervision of Michel Oris and George Alter and contains data for eleven communes, which can represent either a village or a city. The village of Sart stands out in the database because its population registers are unusually accurate and complete. The main sources for the database are the population registers for 1812-1843, 1843-1846, 1847-1866, 1867-1880, 1881-1890, 1890-1900, which contain residential, occupational and demographical information on the

individual members of each household within the community. The volumes were continuously updated with dates and facts about births, deaths, marriages, and migration. Out-migration suffers from some underreporting as people neglected to tell the municipality of their departure, which injects some caution into the registers ability to truly reconstruct the movement of all people covered. In contrast, in-migration is likely to be better recorded.

Model

This analysis explores the assumption that migrant fertility behavior differs from that of non-migrants in Sart, Belgium. The underlying mechanisms are selection, where distinct characteristics made migrants more likely to move, and isolation, where migrants lacked social networks in the place(s) of settlement. Both suggest that migrants have reduced fertility relative to the native born.

The model used considers a conception to be the event/outcome of interest and the migration history of the parents to be the key explanatory variable. In order to account for unobserved heterogeneity in the dataset, we selected a proportional hazard frailty model described by equation (1):

$$\ln h_{ij}(a) = \ln h_0(a) + \beta x_{ij} + \omega_i \quad (1)$$

where $h_{ij}(a)$ is the hazard of conception for parity j for a woman i at duration (time since last conception) a, $h_0(a)$ is the hazard function for conception when all covariates assume value 0, or the baseline hazard, β is the vector of parameters for the individual covariates (x_{ij}) in the model, and ω_i describes the frailty at the level of the wife, assumed to follow a normal distribution.[15]

As the baseline hazard is undefined in a proportional hazard model, the hazard of conception is a multiplicative function of the estimated coefficients of the covariates. Therefore the exponentiated individual coefficients have two possible interpretations. For continuous measures, the ratio represents the expected change in the hazard of conception for a one unit change in the corresponding covariates. For categorical measures, the ratio is the expected change in the risk of conception for a given value relative to a specified reference category. Values greater than one indicate an increased risk of conception while coefficients lower than one are considered protective.

We limit our analysis to marital fertility, estimating three, period-specific models, which reflect three general periods in the fertility history of Sart. We limit the analysis to conception

within marriage for two reasons. Firstly, previous research has shown that on a local level, fertility in Sart is controlled by Malthusian preventive checks, in other words a restricted access to marriage, which limited the majority of child bearings to the period after matrimony. Secondly, illegitimate fertility is poorly documented and likely to be influenced by factors distinct from those affecting behavior within a marital union.

[insert Table 1 here]

The first period of analysis (1812-1849) corresponds to the era of major population growth in Sart, despite a negative migratory balance (see Table 1). Between 1812 and 1850 population grew from 1,815 inhabitants to 2,549. At this time there were no indications of fertility decline on an aggregate level. During the second period (1851-1874) out-migration increased and caused a significant population decline: in 1874 Sart had only 2,231 inhabitants. Crude birth rates, however, remained high. The third period (1875- 1899) was characterized by an overall decline in Walloon birth rates. Population further declined to 2,091 people in 1900. Although in Sart birth rates remained high until the 1890's, the 1870's were also a turning point according to Alter et al. because the Coale-Trussell parameter for marital fertility *m* increased from -0.03 to 0.28 between 1870 and 1899, indicating the use of parity specific fertility control. During this last period female immigration rates also increased, from 2.66% in 1851-1875 to 3.27% in 1876-1900. This is particularly true after 1894 when female migration rates were at their highest, reaching over 4.5 percent.[16]

As the period of observation of a woman may cross these calendar year groupings, the person-days contributed to the analysis by a given woman will be partitioned, attributing to each period the only relevant time at risk of conception. For example if a woman married at the age of twenty three and had her thirty-first birthday on January 1, 1850, the first eight years of her fertility history will be considered in the 1812-49 model, while the remaining part will contribute to the 1850-74 model. Additionally, the fertility histories of women for whom no death, the death of a spouse, a divorce or an outmigration had been reported, were censored five years after the previous conception. The assumption is that the woman was no longer at risk of another birth, considering her previous birth to be her last. The reason for this is twofold. Firstly, given that all married women between age fifteen and fifty are considered at risk, unreported outmigration and separation between these ages may seriously distort the sample of women at risk. Applying a five-year waiting period reduces this distortion.

Secondly, empirical research has shown that it is unlikely that women give birth after a five year interval.[17]

Variables

[insert Table 2 here]

To analyze the relative impact of the migration history of both partners, we use a categorical variable based on the place of birth of both husband and wife. This variable identifies four distinct categories: 1) neither the husband or wife is a migrant (reference), 2) only the wife is a migrant, 3) only the husband is a migrant, and 4) both the husband and wife are migrants.

The construction of the migration measure requires a number of definitional decisions. Firstly, we are able to distinguish migrants from natives only by considering the place of birth of the individual, which does not allow a full reconstruction of residential changes prior to arrival in Sart. Secondly, we define a migrant woman only as someone born outside of Sart who migrates prior to her twenty-seventh birthday. Older migrants are eliminated as some or all of their fertility history was experienced outside of Sart. Previous work on Verviers has shown that migrant women who arrived in the place of settlement after already being exposed to the risk of birth may be distinct from those who moved prior to marriage. In the case of Sart, there are few women who immigrated as children and the average age of migration was twenty-seven, which approximately coincided with the average age at first marriage, which was between twenty-six and twenty-eight. Research by Neven for another rural area in the Ardennes, the Land of Herve, showed that only women who migrated before marriage experienced significantly different fertility behavior from natives. The age of twenty-seven can thus be seen as a symbolic breaking point, which is a proxy for the start of the marital reproductive period. From a methodological perspective, those who arrive after the age of twenty-seven are hard to identify in terms of parity as children who died previous to arrival would not be recorded. For men there is no clear link between migration and age at marriage. Therefore we do not take into consideration the age of the husband at marriage.[18]

In fertility analysis, one important factor to distinguish is whether the woman could plausibly be breastfeeding. We account for this by introducing an indicator variable signaling the presence of an infant of age one or less in the family. This was considered to be a time-varying covariate, which changes value when children were born, when infants died or at the

first birthday. This variable can be seen as an indicator of the protective effect of having a living infant in terms of reduced fecundity and less frequent sexual relations. Breastfeeding prolongs the period of postpartum amenorrhea, the temporary sterility after giving birth. It is usually agreed that until their first birthday, children were breastfed. Furthermore, during the nineteenth century people were advised not to have intercourse during the lactation period following the popular belief that 'sperm spoils the milk' ('*Sperme gâte le lait')*.[19]

To take into account variation in fertility behavior attributable to economic characteristics of the household, we include information on the occupation of the husband. Since data for females was very incomplete, only the occupation of the husband was considered. This information is allowed to change over time, assuming a different value if a different occupation is declared. Although this ensures a good level of accuracy, it is possible that occupation may not be current at time of risk since this information was only included in the registers at events (births, marriages, migration). The analysis considers two categories of self-employed people and/or skilled professions (agriculture and middle class); three of wage workers (agricultural, non-agricultural and unspecified) and the final group accounts for people with no declared occupation (not professional). This latter group consists of unemployed individuals, but it also considers those sustained by income from property, savings and investments and also people receiving state allowances. It is consequently a very heterogeneous category. Table 2 evidences a shift in the occupational distribution of husbands. Within the agricultural sector a decline is seen after 1850 in those men who were self employed, and their share remained more or less stable for the latter period, while with this same periodization increases were seen amongst agricultural workers, although of a smaller magnitude. The share of middle class and not professionals, on the other hand, incremented over the three periods.

We expect self-employed individuals, especially within the agricultural sector, to display a higher marital fertility than wage workers. In a system where economic independence was a necessity for marriage, where population pressure and equal division of inheritances existed, access to a self-sustaining enterprise was achieved by postponing marriage. This reflects a traditional Malthusian fertility pattern, where family size is controlled by late marriage. Wage-dependent couples were more likely to marry younger, resulting in a greater necessity to control fertility within marriage. It is difficult to predict results for 'not professionals' since the diverse composition of this group.

The age of the wife has a strong influence on the probability of another conception. Even in "natural fertility regimes" fecundity and fertility gradually declined as women became older.

This decrease was particularly marked starting from the late thirties, a result of biological factors and of decreased coital frequency. Coale and Trussell believe this age specific pattern of natural fertility was reflected in a convex curve, while a more linear or even concave shape indicated parity-specific birth control. We treat age of the wife as a time varying covariate grouped into the ten-year age interval age fifteen to twenty-five and then five-year age intervals up until age fifty.[20]

We also account for the sex composition of surviving children in the household, which may shed light on conscious fertility choices. For example, if couples preferred wage earning over caretaking offspring, the desire for a son might be larger and vice versa.

Results

[insert Table 3 here]

We find that couples in which both partners were migrants were at a significantly lower risk of conception relative to their native-born peers, at least for the second half of the nineteenth century. In both the periods 1850-1874 and 1875-1900 the migrant couples had significantly lower risks of conception relative to native couples – 37% and 25% respectively. In accordance with our hypothesis, this suggests that migrants were more likely to have lower fertility than natives. As expected, before 1850 there were no significant differences since fertility control was rare before that date. For the post-1850 periods, couples of which only the husband or the wife was an immigrant reported very small and non-significant reductions in the risk of conception with respect to the reference category. It was only in the case when both the husband and wife were migrants that the risk of conception was significantly lower. We expected the wife's migrant experience to be more decisive than that of the husband. This proved true, although the effect is only small and not significant.

Next to migration, breastfeeding and age are significant determinants of conception. As expected, breastfeeding was strongly associated with reduced odds of conception. The effect is highly significant and negative for all three periods, suggesting that the presence of an infant reduces the risk of conception 84%, 82% and 67% for the first, second, and third period of analysis. Breastfeeding has often been linked to 'natural' fertility: before the fertility decline different breastfeeding practices accounted for most of the geographical variation in fertility.[21]

In addition, the age of the wife is related to fertility in predictable ways. Older women tended to have lower fertility, which is reflected in the estimated coefficients. This pattern remained very stable over time. Each age interval demonstrates an increasingly protective association with the hazard of conception, relative to the reference category – twenty-five to twenty nine.

Additional measures of the sex-composition of surviving children demonstrate a significant association with conception during the second period of analysis. Only in the second period, 1850-1874, families with no children present displayed a 44% lower risk of conception. This relationship, reflected in the direction of the estimated coefficients, was potentially present during the other time periods. Although this may reflect couple's preference to remain childless, it could also be indicative of the presence of biologically infertile couples in the population. There is some evidence that families with only sons had a higher risk of conception, which may indicate that people preferred to have daughters as well, but the estimated coefficient is only marginally significant. The relationship between husband's occupation and the risk of conception resists a straightforward interpretation. However, the main hypothesis that self-employed farmers had the highest risk of conception is confirmed. It is noteworthy that in the periods 1812-1849 and 1850-1875 the not-professionals have significantly lower fertility. The heterogeneous composition of this group does not offer a clear explanation for this pattern.

Analysis of the Schoenfeld Residuals for each of the models indicates no significant association for the coefficient for migrant status, suggesting that the covariate is not time-dependent within each birth interval. Notably, the frailty variance was small and not statistically significant in each period, indicating that the effects of unobserved family characteristics were minimal. This could be explained by the large number of observed characteristics included in the model.

In summary, the key explanatory variable, migrant status, is significantly and negatively associated with the risk of conception for the period 1850-1874 and 1875-1900. However, the protective association is limited to couples in which both members were migrants. This suggests that migration is related to risk of conception, but the link is limited to a couple-level migration process and does not extend to solo migration by either one or the other partner.

Conclusion and Discussion

The results obtained in this work evidence that migration played a role in the diffusion of fertility behavior. Specifically, in nineteenth century Sart, migrating couples had reduced odds of conceiving another child relative to their native born peers. Notably, this was only the case for the second half of the nineteenth century. This suggested that migrants may have been distinct from non-migrant residents in Sart. This may reflect either a necessity, due to the relative isolation attributable to the process of migration, or a willingness to adopt innovative behavior and/or a more positive attitude towards new reproductive practices (i.e. selection). Although we cannot disentangle the underlying mechanism, the results of our analysis are similar to what was found in the Land of Herve, where migrant women, regardless of their place of origin, were also at a lower risk of conception compared to natives.[22]

By incorporating the migration status of the husband in the analysis we have shown that the effect of migration was the strongest when both marriage partners are migrants. The findings suggest that in the case of only one partner being a migrant, the absence of a social network to provide childcare and general support could be counterbalanced by access to the non-migrant partner's family. In addition, traditional contraceptive strategies (e.g. withdrawal) required the cooperation of both marriage partners. The fact that one partner was 'more open to modern ideologies', did not necessarily mean that the other was as well. Potential spousal conflict certainly provides and interesting track for further research. To this end, more accurate data on literacy, the wife's occupation, etc. are needed. [23]

Most studies on the link between migration and fertility have focused on large or provincial cities, in which social change occurred more rapidly, and come to the conclusion that place of origin holds more explanatory power than the fact of being a migrant per se. In this case we have examined a rural area with relatively late fertility decline. The study of relative laggards in the fertility decline makes clear that not only residential experience is important in explaining fertility differences between migrants and natives, but also the migration experience itself. Further analysis is needed to gain more insight into this complex relation. More detailed data on the characteristics of stayers and movers, for instance on literacy or the presence of wider kin, can help to understand which mechanisms are at stake. The importance of this contribution lies in that it addresses significantly different fertility trajectories between migrant and non-migrant populations. This work is a useful step toward characterizing the role of human migration in the process of nineteenth century European fertility decline.

Longitudinal case studies about differences in behavior between natives and migrants like this can contribute to a more accurate understanding of the role of migrants in macro-

demographic processes. Moreover, they can pave the way for a more complete conceptualization of the process of diffusion in the fertility decline. A logical next step would be to consider the possibility that areas with significant in-migration change to reflect the fertility behaviors of the mobile populations, testing the degree to which migrants impact their destination context. We consider the work presented here to be a modest yet important step toward linking the diffusion of ideas with the diffusion of people.

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[10] Robert Bach, "Migration and fertility in Malaysia: A tale of two hypotheses," *International Migration Review* XV(1981), 502-521; Michael Anderson *Family Structure in Nineteenth Century Lancashire* (London, 1971); Oris, *The age at marriage*; Rachel G. Fuchs and Leslie Page Moch, "Invisible Cultures: poor women's networks and reproductive strategies in nineteenth century Paris," in: Susan Greenhalgh (ed.) *Situating fertility: anthropology and demographic enquiry* (Cambridge, 1995), 102; Jean-Pierre Bardet, "Innovators and imitators in the practice of contraception in town and country", in A.d Van der Woude, Jan De Vries and A. HAYAMI (eds.), *Urbanization in History. A process of dynamic interactions* (Oxford, 1990,) 264-281; Massimo Livi-Bacci, *A History of Italian fertility during the last two centuries* (Princeton, 1977), 271.

[11] In the case of Sart, it is unlikely that migrants came from higher fertility contexts. Literature has shown that most migrating people in the area had at least some urban experience. George Alter and Michel Oris, "Access to marriage in the East Ardennes during the nineteenth century," in Isabelle Devos and Liam Kennedy (eds.) *Marriage and the rural economy. Western Europe since 1400* (Turnhout, 1999), 133-151. But even the Flemish

areas (where the migrants with the highest fertility traditionally came from) had levels of fertility that were not much higher than those of Sart. See Lesthaghe, *The decline of Belgian fertility*.

[12] Neven, *Individus et familles*, 403-404; Van Bavel, *Diffusion effects*, 77-82.

[13] The index of marital fertility measures the observed amount of births within marriages relative to the number of births that would have occurred among the Hutterites (population with highest marital fertility on record). Lesthaeghe uses the 0.7 level as a cut-off between *natural* (determined by biological features only) and *controlled* (use of contraception) fertility. Natural fertility however, covers a wide range of overall fertility levels, some of them below 0.7. The cut-off is therefore somewhat artificial. However when no detailed data on age, proportion married, marriage duration or parity are available, the I_g-level of 0.7 is used as a proxy to reveal general fertility control. Alternatively some authors have used a decrease of 10% in fertility levels as an indication of overall fertility control For Belgium both methods generate a similar outcome. See Ron Lesthaeghe, *The decline of Belgian fertility 1800-1970* (Princeton, 1977), 97-98; J. Bourgeois-Pichat, "Les facteurs de la fécondité non-diriée," *Population* XX(1965), 383-424; Allan Sharlin "Urban-rural differences in fertility in Europe during the demographic Transition," in Ansley Coale and Susan C. Watkins (eds.) *The Decline of Fertility in Europe* (Princeton, 1986), 234-260.

[14] The total fertility rate (TRF) is the sum of the age-specific birth rates of women in a specified population. The total marital fertility rate (TMFR) is limited to the married section of the female population. Alter and Oris, *Access to marriage*, 133-151. In this article Sart is contrasted with nearby Tilleur which has a more 'modern' marriage and fertility pattern.

[15] Terry M. Therneau and Patricia M. Grambsch, *Modelling survival data. Extending the Cox model.* (New York, 2000).

[16] Alter, Oris and Neven, *When protoindustry collapsed*, 140, 145, 150; Lestaheghe, *The decline of Belgian fertility*, 95-141.

[17] Jan Van Bavel, "Diffusion effects in the European fertility transition: historical evidence from within a Belgian town (1846-1910)," *European Journal of Population* XX(2004), 69.

[18] Alter, *Family and the female life course*; Alter, Oris and Neven, *When protoindustry collapsed*, 140, 145, 150; Neven, *Individus et famille*, 403-404.

[19] Vandenbroeke, *Karakteristieken*, 126.

[20] Ansley J. Coale and T. Trussell, "Model fertility schedules: variations in the age structure of childbearing in human populations," *Population Index*, IL(1974), 185-258.

[21] Simon Szreter, *Fertility, class and gender in Britain, 1860-1940* (Cambridge, 1996), 370-371.

[22] Neven, *Individus et familles*, 403-404.

[23] The prevailing method was withdrawal, see Angus McLaren, *A history of contraception: from antiquity to the present day* (Oxford, 1990).