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This article focuses on the fertility behavior of migrants within the village of Sart, Belgium—that is, all of the individuals born outside the village, regardless of their place of origin, whether urban or rural. Its aim is to assess whether receiving populations differ from migrants in marital fertility behavior. The analysis accounts for both partners in a marriage, shedding light on an important group that is often absent from historical fertility research.[1]

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1 Joseph A. Banks, *Victorian Values: Secularism and the Size of Families* (London, 1981); Chris Vandenbroeke, "Karakteristieken van het huwelijks- en voortplantingspatroon: Vlaanderen en Brabant 17de–19de eeuw," *Tijdschrift voor Sociale Geschiedenis,* I (1976), 107–137; John B. Casterline, "Diffusion Processes and Fertility Transition: Introduction," in *idem* (ed.), *Diffusion Processes and Fertility Transition: Selected Perspectives* (Washington D.C., 2001), 1–38; 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), 63–85; Leslie Page Moch, "The History of Migration and Fertility Decline: The View from the

Research that considers migrant fertility in historical European populations is limited, largely because of the poor maintenance of migration records that pertain to historical populations. Population registers provide detail about in/out-migration to/from a fixed geographical point for certain nineteenth-century populations, but they are available only in a handful of countries (for example, Belgium, Italy, the Netherlands, and Sweden). A second limitation is methodological. For decades, the dominant method of studying fertility behavior has been family reconstitution—a technique that omitted people born, married, or deceased outside a 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 a particular population.[2]

Despite the limited attention given to migrants, a number of studies link migration and fertility, coming to mixed conclusions. In some cases, immigrants had lower fertility than natives. Studying the German town of Würzburg, 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 obtain for nineteenth-century Verviers, Belgium, and Bremen, Germany. In the German case, lower migrant fertility is attributed to longer birth intervals relative to those of natives. Work in the Flemish port city of Antwerp indicates that (semi)rural immigrants adopted spacing behavior with greater frequency than natives and urban immigrants did. Migration, however, is not always associated with lower fertility. In nineteenth-century Geneva, Switzerland, immigrant women tended to have higher fertility rates than the native-born, linking female migration to increased population growth. Moreover, significant fertility differences are not always evident. In the Belgian town of Charleroi during the nineteenth century, migrant reproductive behavior converged with that of the native-born; the fertility decline shows similar intensity for both groups.[3]

Road," in John Gillis, Louise Tilly, and David Levine (eds.), *The European Experience of Declining Fertility, 1850–1970: The Quiet Revolution* (Cambridge, Mass., 1992), 176.

2 Moch, "History of Migration and Fertility Decline," 175–192, 177; George Alter, *Family and the Female Life Course: The Women of Verviers, Belgium, 1849–1880* (Madison, 1988).

3 Allan Sharlin, "Natural Decrease in Early Modern Cities: A Reconstruction," *Past & Present,* 79 (1978), 126–138; Claude Desama, *Population et Révolution Industrielle: Evolution des Structures Démographiques à Verviers dans la Première Moitie' du 19e Siècle* (Paris, 1985); Robert

Although little direct attention has been given to the link between migration and fertility, research on fertility during the nineteenth century recorded important regional variation, which suggests that migration could have been a conduit between distinct fertility regimes. In the case of France, marital fertility levels dropped decisively (by more than 10 percent) before 1830, whereas those of other southern European countries like Spain did not experience a similar decline until the first decade of the twentieth century. The important regional differences in fertility decline discovered by Lesthaeghe in his study of Belgium contributed to a debate about whether the underlying causes of fertility decline in Europe were the socioeconomic factors discussed in the classical literature or the cultural variables emphasized in the findings of the Princeton European Fertility Project (EFP).[4]

LINKING THE DIFFUSION OF IDEAS TO THE DIFFUSION OF PEOPLE

The geographical spread of fertility behavior could well be related to the increased mobility of people in nineteenth-century Europe. Previous research shows that the marital patterns of migrants, an apparently fundamental constraint to nineteenth-century fertility,

Lee, "Labor Market Constraints and the Integration of Urban In-migrants: The Case of Bremen, 1815–1914," in René Leboutte (ed.), *Migrations and Migrants in Historical Perspective: Permanencies and Innovations* (Bern, 2000), 165–205; Sarah Moreels, Mattijs Vandezande, and Koen Matthijs, "Fertility in the Port City of Antwerp (1846–1920): A Detailed Analysis of Immigrants Spacing Behaviour in an Urbanizing Context," working paper, the Scientific Research Community Historical Demography (http://soc.kuleuven.be/ceso/historischedemografie/resources/pdf/WOG%20working%20paper14.pdf); Alfred Perrenoud, "Aspects of Fertility Decline in an Urban Setting: Rouen and Geneva," in Ad van de Woude, Jan de Vries, and Akira Hayami (eds.), *Urbanization in History: A Process of Dynamic Interactions* (Oxford, 1995), 243–263; Thierry Eggerickx, "The Fertility Decline in the Industrial Area of Charleroi during the Second Half of the Nineteenth Century: Did Sedentaries and Migrants Have a Different Behaviour?" *Belgisch Tijdschrift voor Nieuwste Geschiedenis—Revue belge d'histoire contemporaine,* XXXI (2001), 403–429.

4 Ron Lesthaeghe, *The Decline Of Belgian Fertility 1800–1970* (Princeton, 1978); Frank W. Notestein, "Population—the Long View," in Theodore W. Schultz (ed.), *Food for the World* (Chicago, 1945), 37–57; John E. Knodel and Etienne Van de Walle, "Lessons from the Past: Policy Implications of Historical Fertility Studies," *Population and Development Review,* V (1979), 217–245; Jean-Claude Chesnais, *The Demographic Transition: Stages, Patterns and Economic Implications: A Longitudinal Study of Sixty-Seven Countries Covering the Period 1720–1984* (New York, 2000); Ansley J. Coale, "The Demographic Transition Reconsidered," in *Proceedings of the International Population Conference* (Liège, 1973), I, 53–72; *idem,* "The Decline of Fertility in Europe since the Eighteenth Century as a Chapter in Human Demographic History," in *idem* and Susan S. Watkins (eds.), *The Decline of Fertility in Europe* (Princeton 1986), 1–30.

are distinct from those of the native-born. Recent work shows that migration is usually not a decisive break; migrants often maintain social networks with their household and community of origin. Therefore, the increase in migration in general and temporary movements in particular during the second half in the nineteenth century plausibly resulted in sustained links between rural and urban populations.

The majority of the sparse studies that link migration and fertility focus on urban or industrialized localities—centers of profound socioeconomic change. Most of this work suggests that migrants who moved from a traditional place (and thus high fertility) to a modern area (and thus low fertility) tended to adapt to their new setting after initial differences in fertility. Yet, Van Bavel's research on the provincial town of Leuven suggests that those who moved from a modern to a traditional area were unlikely to change their behavior. The implication is that fertility-behavior adaptation on the part of migrants might have been dependent on the extent to which their contexts of origin and destination were urban.[5]

Other characteristics besides context are important. The studies of two industrial centers in French-speaking Belgium (Tilleur and Charleroi) by Oris and Eggerickx suggest that Flemish rural migrants had the highest fertility during the initial stages of the Belgian fertility decline, although the results for other migrant centers are inconclusive. Research that focused on migrants' language of origin suggested that women who originally spoke French had lower fertility than those who did not. Neven's investigation of the French-speaking rural region of Herve, however, does not support this conclusion. Migrant women there had significantly lower fertility than native women did, regardless of origin, language, etc. Clearly, the context (origin and destination) and individual characteristics of the migrant provide some insight, but the relationship between migration and fertility is not entirely straightforward.[6]

5 Van Bavel, "Diffusion Effects."

6 Eggerickx, "Fertility Decline in the Industrial Area of Charleroi"; Michel Oris, "The Age at Marriage of Migrants during the Industrial Revolution in the Region of Liège," *History of the Family,* V (2000), 391–413; Moch, *Paths to the City: Regional Migration in Nineteenth-Century France* (Beverly Hills, 1983), 136–138; Eliah Ben Moche and Don Friedlander, "Occupations, Migrations, Sex Ratios and Nuptiality in Nineteenth Century English Communities: A Model of Relationships," *Demography,* XXIII (1986), 1–12; Katherine Lynch, "Geographical

The mechanisms by which migration could influence fertility can be organized according to three concepts—disruption, isolation, and selection. Despite the lack of definitive conceptual distinction, each of these pathways leads to an expectation of lower fertility for migrants relative to women born in the host setting. Disruption is relatively straightforward; the process of migration leads to a postponement of childbirth for psychological and practical reasons. Although disruption is likely to be temporary, it endures long enough to predict lower short-term risk of pregnancy.

Isolation and selection describe the role of migration during a longer period of time. First, migrants are assumed to be more isolated than natives, since they do not have an established social network. The fact that immigrants usually marry at an older age than natives do is often attributed to their difficulties in integrating into a new environment. Even long-term and relatively settled immigrants are susceptible to this hardship. Capron found that some of the lineages in nineteenth-century Sart were likely to move away, while others largely remained in place. Many of the natives there belonged to stable extended family networks. The lack of such a web of relatives can negatively affect a couple's fertility decisions, given the increased burden that childbearing can place on relatively isolated migrant parents.[7]

The individuals "selected" to enter into the migration process often had characteristics that distinguished them from both the population of their destination and that of their origin. Age and occupation are two such possible characteristics, but so are a variety of unobserved preferences concerning secularization and independence. For example, in eighteenth-century Rouen and its surroundings, migrants had higher levels of literacy than those who

Mobility and Urban Life: Comparative Perspectives on American and European Demographic Trends in the Past," in Alain Bideau (ed.), *Les systèmes démographiques du passé* (Lyon, 1996), 203–223; Moch, "History of Migration and Fertility Decline," 190; Perrenoud, "Aspects of Fertility Decline," 243–263; Oris, "Fertility and Migration in the Heart of the Industrial Revolution," *History of the Family,* I (1996), 169–182; Van Bavel, "Diffusion Effects," 77–82; Muriel Neven, *Individus et familles: les dynamiques d'une société rurale: le Pays de Herve dans la seconde moitié du XIXe siècle* (Genève, 2003), 403–404.

7 Catherine Capron, "Essai de reconstruction automatique des parentés à partirdu registre de population belge," *Revue Informatique et Statistique dans les Sciences humaines,* XXXIV (1998), 9–49; Alter and *idem,* "Leavers and Stayers in the Belgian Ardennes," in Frans van Poppel, Oris, and James Lee (eds.), *The Road to Independence: Leaving Home in Western and Eastern Societies, XVIth–XXth Centuries* (Bern, 2004), 117–141.

remained behind. Migrants are often regarded as being more open to innovation and change. As a consequence, they might have been more receptive to new ideas regarding fertility control that surfaced around the middle of the nineteenth century in most European countries. Geographical distance from relatively more conservative places of origin can amplify these inclinations.[8]

Although the literature suggests that the process of selection into migration as well as the disruptive and isolating nature of migration itself can lead to lower fertility, there are alternative potential trajectories. Specifically, the immediate disruption of the migration event can give way to a recovery of fertility subsequent to settling in a new context, theoretically encouraging increased fertility at certain ages. Similarly, fertility could have recovered as the effect of isolation waned and migrants became accustomed to a new setting. The nature of the sending and receiving context could also have factored into any observed fertility differences, particularly if the point about selection criteria is pertinent. In that regard, if fertility was higher in the context of origin than in that of the destination, migrants might have reverted to the familiar state of higher fertility when they arrived. Nothing about our analytical strategy prevents such patterns from emerging, despite the general thrust of the theoretical literature toward a negative relationship between migration and fertility.[9]

An additional consideration, which is unique to this study, is the migrant status of both partners in a given union. Incorporating the migrant status of husbands allows us to determine differences in fertility behavior depending on whether only one or both

8 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, "Age at Marriage"; Rachel G. Fuchs and Moch, "Invisible Cultures: Poor Women's Networks and Reproductive Strategies in Nineteenth Century Paris," in Susan Greenhalgh (ed.), *Situating Fertility: Anthropology and Demographic Enquiry* (New York, 1995), 86–107, 102; Jean-Pierre Bardet, "Innovators and Imitators in the Practice of Contraception in Town and Country," in Van der Woude, de Vries, and Hayami (eds.), *Urbanization in History,* 264–281; Massimo Livi-Bacci, *A History of Italian Fertility during the Last Two Centuries* (Princeton, 1977), 271.

9 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. Alter and 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 (whence the migrants with the highest fertility traditionally came) had levels of fertility that were not much higher than those of Sart. See Lesthaeghe, *Decline of Belgian Fertility,* 106.

spouses were migrants. The effect of migration on fertility, when the selection mechanism is at play, could be strongest when both marriage partners were immigrants. Both partners would have carried fertility behavior from their context of origin, making them even more isolated from the fertility context of their new home. By the same token, dual-migrant marriages also had the potential to be more protected from the disruptive and isolating components of migration. The effect of two migrant partners on fertility is not entirely clear.

Since a perspective that takes into account both selection and isolation builds upon the idea of fertility as a process of conscious decision making, we predict that migration had a significant effect only after 1850; before that date, most of Belgium showed no evidence of effective birth control. The guiding assumption of this study is that migrants to Sart—particularly migrants who were partners—underwent a significantly lower risk of conception than did those who were born there, particularly after 1850.[10]

THE CASE OF SART Although Belgium experienced a dramatic decline in national crude birth rates and marital-fertility levels around 1880, research has detected nontrivial differences between Dutch-speaking Flanders and French-speaking Wallonia. In some Walloon districts, marital fertility (I_g) fell below 0.7 before 1880, whereas the first Flemish districts to reach this level were the urban centers of Ghent and Antwerp in 1900. One explanation of this trend is the more rapid shift toward fertility control in urban areas relative to rural districts. Urban/rural differences were, however, less notable in Wallonia.[11]

10 Neven, *Individus et familles,* 403–404; Van Bavel, "Diffusion Effects," 77–82.

11 The index of marital fertility measures the observed number of births within marriages relative to the number of births that would have occurred among the Hutterites (the population with the 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. Since natural fertility covers a wide range of fertility levels, some of them below 0.7, the cut-off is artificial to some extent. Yet 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 Lesthaeghe, *Decline of Belgian Fertility,* 97–98; J. Bourgeois-Pichat, "Les facteurs de la fécondité non-dirigée," *Population,* XX (1965), 383–424; Allan Sharlin, "Urban-Rural Differences in Fertility in Europe during the Demographic Transition," in Coale and Watkins (eds.), *Decline of Fertility in Europe,* 234–260.

By focusing on Sart, more a village than a city, this article intends to complement previous efforts that 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). Industrialization was booming nearby from the middle of the nineteenth century onward. Verviers, less than 10 km away, developed into an industrial textile center, and Liège, about 30 km away, became a center of mining and steel. Sart's predominantly rural setting, near to industrializing areas, provides a unique opportunity to compare the fertility of natives with that of a varied inflow of migrants.

Nineteenth-century Sart exemplified the Malthusian European marriage pattern, evincing a relatively advanced average age at first marriage and large proportions of people who never married. Based on different estimation methods, the average age at first marriage for women varied between 26.9 and 28.3 from 1812 to 1899—a range that remained 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 unmarried. This restrictive nuptiality severely affected fertility: The total fertility rate (TFR) was only 4.9, whereas the total marital fertility rate (TMFR) was 9.2. Nevertheless, the natural balance in Sart remained positive, resulting in an intense out-migration during the second half of the nineteenth century.[12]

The nineteenth-century demographic regime in Sart falls roughly into three periods, as demonstrated in Table 1. During the first period (1812–1849), Sart's population grew remarkably, despite a negative migratory balance, from 1,815 to 2,549 inhabitants, with no indications of fertility decline on an aggregate level. During the second period (1850–1874), out-migration increased, causing a significant population decline; Sart had only 2,231 inhabitants in 1874. Crude birth rates, however, remained high. The third period (1875–1899) saw a general decline in Walloon's birth rates. Population declined further to 2,091 people in 1900. Although birth rates in Sart remained high until the 1890s, Alter et al. viewed the 1870s as a turning point because the Coale-Trussell

12 TRF is the sum of the age-specific birth rates of women in a specified population. TMFR is limited to the married section of the female population. Alter and Oris, "Access to Marriage." In this article, Sart is contrasted with nearby Tilleur, which shows a more "modern" marriage and fertility pattern.

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 percent between 1851 and 1875 to 3.27 percent between 1876 and 1900. This shift occurred mainly after 1894 when female migration rates were at their highest, reaching more than 4.5 percent.[13]

SOURCES AND METHODS To compare migrant and native fertility behavior in Sart, this study employs data from the Historical Database of the Liège Region, which was constructed under the supervision of Oris and Alter. It contains data for eleven communes, which were either villages or cities. The village of Sart is distinguished in the database because its population registers are unusually accurate and complete. The main sources for the database are the population registers for 1812 to 1843, 1843 to 1846, 1847 to 1866, 1867 to 1880, 1881 to 1890, and 1890 to1900, which contain residential, occupational, and demographic information about the individual members of each household within the community. The volumes were continuously updated with dates and facts about births, deaths, marriages, and migration. Since people did not always inform the municipality of their departure, outmigration suffers from some underreporting, which injects a modicum of caution into the registers' ability to reconstruct everyone's movements. In contrast, in-migration probably was better recorded.[14]

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. Survival analysis is employed, and, to account for unobserved heterogeneity in the dataset, Cox proportional-hazard models with shared frailty are used, as described by equation (1):

$$\ln h_{ij}(a) = \ln h_{o}(a) + \beta x_{ij} + \omega_{i} \qquad (1)$$

13 Alter, Oris, and Neven, "When Protoindustry Collapsed: Fertility and the Demographic Regime in Rural Eastern Belgium during the Industrial Revolution," *Historical Social Research,* XXXII (2007), 137–159, 140, 145, 150; Lestaheghe, *Decline of Belgian Fertility,* 95–141.

14 Oris, Alter, and Neven, "Population Registers of Sart, Belgium, 1811–1900," DOI:10.3886/ICPSR32461.v1, distributed by the Inter-university Consortium for Political and Social Research (University of Michigan, Ann Arbor, 2011).

Table 1 Components of Population Change in Sart, 1812–1900

	1812–1849	1850–1874	1875–1900
Net Change	539 (1,815 to 2,345)	−123 (2,345 to 2,231)	−140 (2,231 to 2,091)
Average yearly natural balance[a]	27.6[c]	16.7	17.4
Average yearly migratory balance[b]	−8.9[c]	−29.7	−24.4
Average yearly male immigration rate	unknown	2.60%	2.80%
Average yearly female immigration rate	unknown	2.66%	3.27%
Average yearly crude birth rate	32.38	30.27	23.84

[a] The average yearly natural balance is the annual surplus or shortfall of the population in absolute numbers due to biological population movements. The balance of year x is calculated by counting the number of births and subtracting the number of deaths in the population of year $x-1$.

[b] The average yearly migratory balance is the annual surplus or shortfall of the population in absolute numbers due to migration of the population. The balance of year x is calculated by counting the number of immigrations and subtracting the out-migrations from the population of year $x-1$.

[c] For the period 1812 to 1849, data are available only for the years 1841–1850.

SOURCES Sven Vrielinck, *De Territoriale Indeling van België (1795–1963): Bestuursgeografisch en Statistisch Repertorium van de Gemeenten en de Supracommunale Eenheden* (Leuven, 2000); Ministère de l'Intérieur de Belgique, *Statistique de la Belgique: Population:Mouvement de l'Etat Civil* (Brussels 1831–1849); Historische Databank Lokale Statistieken—hisstat (a project for digitizing statistics, in progress), Dept. of History, Ghent University (thanks to Eric Vanhaute, Sven Vrielinck, and Torsten Wiedemann for the data).

where $h_{ij}(a)$ is the hazard of conception for parity j for a woman i at duration (time since last conception) a; $h_o(a)$ 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 ωi is the random effect (frailty) at the family level (all conceptions of woman i).[15]

Given that 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 exponentiation of the individual coefficients has two possible in-

15 Terry M. Therneau and Patricia M. Grambsch, *Modelling Survival Data: Extending the Cox Model* (New York, 2000). Estimates assume a normal distribution for the frailty parameter. Identical models that assume a gamma-distributed frailty give almost identical results, suggesting that the results are not sensitive to distributional assumptions.

terpretations. 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, and coefficients lower than one are considered protective.

The analysis is divided into three period-specific models, 1812 to 1850, 1851 to 1874, and 1875 to 1899, which reflect the three general periods in the fertility history of Sart, as described above. This study is limited to marital fertility for two reasons. First, previous research has shown that, on a local level, fertility in Sart was controlled by Malthusian preventive checks—in other words a restricted access to marriage, which limited the majority of births to the period after matrimony. Second, illegitimate fertility is poorly documented and likely to be influenced by factors distinct from those affecting behavior within a marital union.

Since the period of observation of a woman might cross these calendar-year groupings, the person-days contributed to the analysis by a given woman are partitioned, attributing to each period only the relevant time at risk of conception. For example, if a woman married at the age of twenty-three and her thirty-first birthday occurred on January 1, 1850, the first eight years of her fertility history would belong to the 1812 to 1849 model, whereas the remaining part would contribute to the 1850 to 1874 model. Additionally, the fertility histories of women with no reported death, widowhood, divorce, or out-migration were censored five years after the previous conception. The assumption is that she was no longer at risk of another birth—that her previous birth was her last. The reason is twofold: (1) Given that all married women between the ages of fifteen and fifty are considered at risk, unreported out-migration and separation between these ages would introduce a serious distortion into the sample of females at risk. Applying a five-year waiting period alleviates this distortion. (2) Empirical research has shown that it is unlikely for women to give birth after a five-year interval.[16]

In order to understand the relative effect of both parents' migration history, this analysis uses a categorical variable based on

16 Van Bavel, "Diffusion Effects," 69.

Table 2 Descriptive Statistics for Multivariate Analysis

	1812–1849	1850–1874	1875–1900	ALL PERIODS
Migrant status				
Neither partner born outside of Sart	70.6%	68.9%	68.4%	69.5%
Wife born outside of Sart	6.1%	8.4%	10.6%	8.0%
Husband born outside of Sart	18.9%	17.0%	15.3%	17.4%
Both partners born outside of Sart	4.4%	5.8%	5.7%	5.1%
Presence of an infant				
no	72.8%	72.0%	72.4%	72.5%
yes	27.2%	28.0%	27.6%	27.5%
Age of Wife				
15–25	9.2%	9.3%	9.3%	9.3%
25–30	19.1%	19.5%	20.6%	19.6%
30–35	22.1%	22.4%	23.8%	22.7%
35–40	21.9%	22.1%	21.9%	21.9%
40–45	18.2%	18.0%	17.4%	18.0%
45–50	9.6%	8.7%	6.8%	8.6%

Occupation of Husband				
Agriculture	73.0%	61.7%	61.4%	66.6%
Middle-class	6.2%	9.7%	14.4%	9.5%
Nonprofessional	0.8%	4.9%	9.2%	4.3%
Agricultural worker	5.2%	8.4%	8.8%	7.1%
Nonagricultural worker	0.2%	1.8%	1.0%	0.9%
Unspecified wage worker	14.6%	13.5%	5.2%	11.7%
Surviving children				
1+ daughter, 1+son	53.5%	60.5%	54.7%	55.8%
1+ daughter, 0 son	16.5%	13.4%	16.4%	15.6%
0 daughter, 1+ son	21.0%	14.0%	17.0%	17.9%
0 daughter, 0 son	9.0%	12.2%	11.9%	10.7%
Total person-years observed	5,234	3,429	3,276	11,938

NOTE The percentages are the number of person-years observed for a given characteristic, divided by the total number of person-years observed.

husbands' and wives' place of birth that identifies four distinct categories: (1) neither husband nor wife being a migrant (reference), (2) only the wife being a migrant, (3) only the husband being a migrant, and (4) both husband and wife being migrants.

The construction of the migration measure requires a number of definitional decisions. First, migrants can be distinguished from natives only through their place of birth, which does not allow a full reconstruction of residential changes prior to arrival in Sart. Second, *migrant woman* in this analysis refers only to a woman born outside Sart who in-migrated prior to her twenty-seventh birthday. Older migrants are eliminated on the grounds that all of their fertility history occurred outside Sart. Previous work on Verviers suggests that migrant women who arrived at their destination after already being exposed to the risk of birth should be distinguished from those who moved prior to marriage. But few women immigrated to Sart as children, and the average age of migration, twenty-seven, closely approximates the average age at first marriage, which was between twenty-six and twenty-eight.[17]

Neven discovered that in the rural Malthusian region of Herve, people who married before the expected age were often expelled from their community of origin. Consequently, some women who migrated to Sart prior to age twenty-seven could have experienced isolation, either through their status as single or their "forced" migration. In contrast, women who entered Sart after age twenty-seven probably experienced migration as a common marriage practice—a matter of moving to their husband's hometown after a period of courtship.

It is difficult to interpret data about these women. Because Neven's research also suggested that only women who migrated before marriage exhibited significantly different fertility behavior from that of natives, the age of twenty-seven can be seen as a symbolic breaking point—a proxy for the start of the marital-reproductive period.[18]

Most importantly, given that not all of the motives underlying a given migration are observable, those migrants who arrived after the age of twenty-seven cannot be identified in terms of their parity, since children who died before arrival would not have been recorded. Furthermore, some or all of the children of migrants

17 Alter, *Family and the Female Life Course.*
18 Neven, *Individus et famille,* 403–404.

who entered after age twenty-seven could have stayed behind in the original place of residence. The lack of data about such children, as well as about those who died before their parents' entry into Sart, would have led to miscalculations of parity and therefore to misrepresentations of the variable measuring the sex composition of migrants' surviving children (described below). So far as men are concerned, there is no clear link between migration and age at marriage. Hence, the age of husbands at marriage is not taken into consideration.[19]

In fertility analysis, the likelihood of a woman breast-feeding is a crucial factor. We account for the fact that in nineteenth-century Belgium, breast-feeding was particularly widespread in the French-speaking areas by introducing an indicator variable signaling the presence of an infant one-year-old or younger in a family. This variable is a time-varying covariate, which changes value when children were born, when infants died, or at the first birthday. It can be seen as an indicator of the protective effect of a woman giving birth to a living infant because of the reduced fecundity and less frequent sexual relations associated with breast-feeding. Breast-feeding prolongs the period of postpartum amenorrhea, the temporary sterility after giving birth. The scholarly consensus is that children of that era were breast-fed until their first birthday. Furthermore, during the nineteenth century, people were advised not to have intercourse during the lactation period in accord with the popular belief that "sperm spoils the milk" *("Sperme gâte le lait")*.[20]

To take into account variation in fertility behavior attributable to the economic characteristics of a household, the occupation of the husband is included. Since occupational information about females is incomplete, only that about husbands is part of this analysis. This variable is allowed to change over time, assuming a different value with every new occupation. Although this strategy ensures a good level of accuracy, an occupation might not have been current at time of risk since such information was included in the registers only at specific events (births, marriages,

19 Alter, *Family and the Female Life Course;* Alter, Oris, and Neven, "When Protoindustry Collapsed," 140, 145, 150; Neven, *Individus et famille,* 403–404; Van Bavel, "The Decline of Belgian Fertility in the Nineteenth Century: What Have We Learned since the Princeton Project?" in Isabelle Devos et al. (eds.), *Histoire de la population de la Belgique et de ses territoires* (Louvain-la-Neuve, 2010), 429–461.

20 Vandenbroeke, "Karakteristieken," 126.

migration). The analysis has two categories of self-employment and/or skilled professions (agricultural and middle-class), three of wage workers (agricultural, nonagricultural, and unspecified), and one heterogeneous category for people with no declared occupation (not professional)—mainly the unemployed but also those sustained by income from property, savings and investments, or state allowances.

Table 2 shows a shift in the occupational distribution of husbands. Within the agricultural sector, the share of those who were self-employed declined after 1850, but it remained more or less stable thereafter. That of agricultural workers slightly increased during this period. The share of middle-class professionals and the group of nonprofessionals increased more significantly during the three periods.

Our expectation was that self-employed individuals, especially within the agricultural sector, would display a higher marital fertility than wage workers would. In a system that saw economic independence as a prerequisite for marriage, complicated by population pressure and the equal division of inheritances, access to a self-sustaining enterprise was achieved by postponing marriage. Such was the traditional Malthusian fertility pattern, in which late marriage governed the exigencies of family size. 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 "nonprofessionals" due to the diverse composition of this group.

The age of the wife is introduced into the models, since it has a strong influence on the probability of another conception. Even in "natural fertility regimes," fecundity and fertility gradually declined as women aged. This change in women's fertility begins in their 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, whereas a more linear or even concave shape indicated parity-specific birth control. The age of the wife is treated as a time-varying covariate, measured not at conception but continuously, allowing women to transition from one category to another during, before, or after a given parity. It was grouped into the age categories of fifteen to twenty-four, twenty-five to thirty, thirty to thirty-five, thirty-five to forty, forty to forty-five, and forty-five to fifty. When the intervals between two conceptions crossed these categories, the

person-days involved in the analysis were partitioned, attributing to each category the relevant time at risk of conception.[21]

Finally, the model also accounts for the sex composition of surviving children in the household, which could shed light on conscious fertility choices. For example, if couples preferred wage-earning offspring over caretaking offspring, the desire for a son might have been stronger, and vice versa.

FINDINGS Table 3 presents—for the periods 1812 to 1850, 1851 to 1874, and 1875 to 1899—the results of Cox proportional-hazard regressions that model the risk of conception by the migration history of the parents, also controlling for the presence of an infant, the age of the woman, the husband's occupation, and the sex composition of surviving children.

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. From 1850 to 1874 and from 1875 to 1900, the migrant couples had significantly lower risks of conception relative to their native born peers—37 percent and 25 percent, respectively. In accord with our expectations, this finding suggests that migrants were more likely to have lower fertility than natives. As expected, no significant differences existed before 1850, confirming that fertility control was rare before that date. For the post-1850 periods, couples in which only the husband or the wife was an immigrant reported small and insignificant reductions in the risk of conception with respect to the reference category. Only when both husband and wife were migrants did the risk of conception lower significantly. Our expectation that wives' migrant experience would be more decisive than husbands' proved true, although the effect is small and insignificant.[22]

Next to migration, breast-feeding and age are significant

21 Coale and James T. Trussell, "Model Fertility Schedules: Variations in the Age Structure of Childbearing in Human Populations," *Population Index,* IL (1974), 185–258.

22 To assess the possible presence of differences in the duration-specific risks of conception according to the entry age of migrants, further migrant-only models were estimated (results not shown herein). This sample was substantially smaller ($n\sim=220$ for each of the three periods of analysis), and each of the models included the same set of covariates presented in Table 3, except for "migration status." The exponentiation of the coefficient obtained for the age at entry was close to 1 (little to no effect) and not significant at the .05 level for any of the periods included. However, the fact that it was marginally significant ($p<= 0.10$) and less than 1 (0.98) for the second period (1850 to 1874) provides some evidence that older migrants had a relatively lower risk of conception.

Table 3 Cox Regression of the Risk of Conception on Migrant Status by Period

PERIOD	1812–1849 EXP(B)	1850–1874 EXP(B)	1875–1900 EXP(B)
Migrant status			
Neither partner born outside of Sart (reference)	—	—	—
Wife born outside of Sart	1.06	0.90	0.93
Husband born outside of Sart	1.09	0.93	0.94
Both partners born outside of Sart	1.06	0.63**	0.75+
Presence of an infant			
Surviving infant ≤ 1 year old *(1=yes)*	0.16***	0.18***	0.34***
Age of wife			
15–24	1.11	1.01	1.05
25–29 (reference)	—	—	—
30–34	0.90	0.93	0.92
35–39	0.81**	0.70***	0.78*
40–44	0.35***	0.41***	0.42***
45–49	0.08***	0.10***	0.10***
Occupation of husband			
Agriculture (reference)	—	—	—
Middle-class	0.91	0.98	0.87
Nonprofessional	0.54+	0.60**	0.94
Agricultural worker	1.01	0.90	0.82
Nonagricultural worker	0.46	0.83	0.88
Unspecified wage worker	0.88	0.97	0.77

Surviving children			
1+ daughter, 1+son *(reference)*	—	—	—
1+ daughter, 0 son	1.11	1.12	1.01
0 daughter, 1+ son	0.98	1.19+	1.06
0 daughter, 0 son	0.89	0.57***	0.82
Frailty variance	0.0013	0.0013	0.0013
Generalized R-square	0.068	0.054	0.034
Person-years observed	5,234	3,429	3,276
Conceptions observed	1,399	942	894
Number of women	502	433	407

+$p<0.1$
* $p<0.05$
**$p<0.01$
***$p<0.001$

NOTE *Conception* is defined as forty weeks prior to a birth and intervals are censored at five years. All models include a frailty component at the level of the mother with a Gaussian distribution.

determinants of conception. As expected, breast-feeding 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 percent, 82 percent, and 67 percent for the first, second, and third periods of analysis, respectively. This link has been established in all of the research about Belgian fertility. Furthermore, breast-feeding has a long association with "natural fertility": Before the fertility decline, breast-feeding practices accounted for most of the geographical variation in fertility.[23]

The age of a wife is related to fertility in predictable ways. The lower fertility of older women is reflected in the estimated coefficients. This pattern remained 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.

The measure involving the sex composition of surviving children demonstrates a significant association with conception during the second period of analysis. Only in the second period, 1850 to 1874, did families with no children display a 44 percent lower risk of conception. This relationship, reflected in the direction of the estimated coefficients, was potentially present during the other time periods. Although it may show a couple's preference to remain childless, it could also be indicative of biologically infertile couples in the population. There is some evidence that families with only sons had a higher risk of conception, possibly signaling a preference for daughters as well, although the estimated coefficient is only marginally significant. In accord with Van Bavel's recent Belgian research, the relationship between husband's occupation and the risk of conception resists a straightforward interpretation: "Within the working classes, the differences found between occupational categories have been inconsistent, not significant, unexpected or simply nonexistent." However, the main assumption that self-employed farmers had the highest risk of conception is confirmed. In the periods 1812 to 1849 and 1850 to 1875, nonprofessionals show a significantly low fertility. The heterogeneous composition of this group does not permit a clear explanation for this pattern.[24]

23 Simon Szreter, *Fertility, Class and Gender in Britain, 1860–1940* (New York, 1996), 370–371.

24 Van Bavel, "Decline of Belgian Fertility": Myron Gutmann and Watkins, "Socio-

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

The key explanatory variable, migrant status, is significantly and negatively associated with the risk of conception for the periods 1850 to 1874 and 1875 to 1900. However, the protective association is limited to couples in which both members were migrants, thus suggesting that migration is related to risk of conception, but that the link is limited to a couple-level migration process. It does not extend to solo migration by either one or the other partner; the behavior of couples in which only one partner migrated seems to conform more closely to that of the native-born.

The results obtained in this work demonstrate 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, though only during the second half of the nineteenth century. Hence, migrants might have not have been integrated too closely with native residents in Sart, either because of the relative isolation attributable to the process of migration or because of their willingness to adopt innovative behavior and/or a more positive attitude toward new reproductive practices (selection). Although, given the observed measures, it is impossible to disentangle the underlying mechanism, the results of our analysis are similar to what was found in Herve, where migrant women, regardless of their place of origin, were also at a lower risk of conception compared to natives.[25]

By incorporating the migration status of husbands in the analysis, we demonstrate that the effect of migration was strongest when both marriage partners were migrants. When only one partner was a migrant, the absence of a social network to provide child

Economic Differences in Fertility Control: Is There an Early Warning System at Village Level?" *European Journal of Population,* VI (1990), 69–101.

25 Neven, *Individus et familles,* 403–404.

care and general support might have been counterbalanced by access to the nonmigrant partner's family. Moreover, traditional contraceptive strategies (for example, 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 one was. Potential spousal conflict certainly provides an interesting avenue worthy of further research. To this end, more accurate data about literacy, wife's occupation, etc., are needed.[26]

Most studies about the connection between migration and fertility have focused on large or provincial cities, in which social change occurred more rapidly than in rural areas. They generally come to the conclusion that place of origin holds more explanatory power than the mere fact of being a migrant. This study of a rural area with a relatively late fertility decline makes clear that residential experience is not the only important explanation for fertility differences between migrants and natives; the migration experience itself matters. Further analysis is necessary to gain more insight into this complex relationship. More detailed data about the characteristics of stayers and movers—for instance about their literacy or the presence of family networks—can help to untangle which mechanisms are most salient. Important, too, are our findings about the significantly different fertility trajectories between migrant and nonmigrant populations.

Longitudinal case studies about differences in behavior between natives and migrants contribute to a more accurate understanding of the role of migrants in macrodemographic processes. They also pave the way for a more complete conceptualization of the process of diffusion in fertility decline. A logical next step would be to consider the possibility that areas with significant inmigration changed to reflect the fertility behaviors of mobile populations, testing the degree to which migrants influenced their destination context.

26 The prevailing method was withdrawal. See Angus McLaren, *A History of Contraception: From Antiquity to the Present Day* (New York, 1990), 154–157.