Residential Context, Migration and Fertility

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Abstract

This study examines fertility variation by residential context. While there is a large literature on fertility trends and determinants in industrialised countries, little research has investigated spatial fertility variation. We study fertility variation across regions with different size and within urban regions by distinguishing between central cities and suburbs of the cities. We use vital statistics and longitudinal data from Britain and apply event history analysis. We investigate to what extent do the socio-economic characteristics of couples and selective migrations explain fertility variation between residential contexts and to what extent do contextual factors play a role. Our analysis shows that fertility levels decline as the size of an urban area increases; within urban regions suburbs have significantly higher fertility levels than the city centres.

Keywords: fertility, residential context, migration, event history analysis, UK

Introduction

Spatial fertility variation has been an under-researched topic in the literature on low fertility in industrialised countries. However, recent contributions to the literature are evidence of the growing interest in spatial aspects of fertility and its importance for the understanding fertility dynamics in industrialised countries (Thygesen et al. 2005; de Beer and Deerenberg 2007; Kulu et al. 2007). Studies show that urban-rural fertility variation has decreased over time, but significant differences between various settlements persist. Fertility levels are higher in rural areas and small towns and lower in large cities. This pattern has been observed for the US (Heaton et al. 1989; Glusker et al. 2000), England and Wales (Tromans et al. 2008), France (Fagnani 1991), the Netherlands (Mulder and Wagner 2001; de Beer and Deerenberg 2007), Italy (Brunetta and Rotondi 1991; Michielin 2004; Vitali and Billari 2011), Germany and Austria (Hank 2001; Kulu 2006), the Nordic countries (Thygesen et al. 2005; Kulu et al. 2007), the Czech Republic (Burcin and Kučera 2000), Poland and Estonia (Kulu 2005; 2006) and Russia (Zakharov and Ivanova 1996).

While studies on urban-rural fertility variation show broadly similar patterns (the larger the settlement, the lower are the fertility levels), it is far from clear why fertility levels are higher in smaller places and lower in larger settlements. Two competing hypotheses are discussed in the literature: the compositional and the contextual. The *compositional* hypothesis suggests that fertility levels vary between places because different people live in different settlements, whereas the *contextual* hypothesis suggests that factors related to immediate living environment are of critical importance. The role of *selective migrations* has also been discussed in the literature; couples with childbearing intentions may decide to move to smaller places that are better suited to childrearing, whereas those with no childbearing plans may migrate to larger settlements.

Although previous research has shed light on spatial aspects of fertility, it suffers from important shortcomings. First, most studies have used aggregate data and respective indices (ASFRs, the TFR), which have been useful in outlining general patterns but less so for finding out the causes of fertility variation by residential context. Second, fertility variation by residential context has been a side-topic in most of those aforementioned studies that have examined disaggregated behavioural patterns using individual-level data. The causes of fertility variation by residential context have been briefly discussed in these studies rather than being thoroughly analysed. Third, the role of selective migrations in spatial fertility variation has not been examined in detail.

In this study, we examine fertility variation by residential context. We go beyond the urban-rural dichotomy and distinguish residential contexts by the size of area and the density of its population. Further we also investigate fertility variation within urban regions by distinguishing between central cities and suburban areas of the cities. While recent research from Nordic countries has shown that fertility levels vary significantly within urban regions, the reasons for this variation are far from clear (Kulu et al. 2009; Kulu and Boyle 2009). We investigate to what extent do the socio-economic characteristics of couples and selective migrations (or residential moves) explain fertility variation between various residential contexts and to what extent do contextual factors play a role. We conduct our study in Britain. Recent studies have investigated spatial fertility variation in Nordic countries, little research has been conducted in other low fertility countries. The British case is interesting for two reasons. First, it has been argued that no one lives in rural areas any more in Britain (perhaps except in Scotland); while this may be partly true, nevertheless, people live in areas of different size, density and vicinity to nature. Second, Britain has a ‘real’ world city, London. With a population of 7 to 10 million (depending on the definition of the urban area) it offers a good case to study fertility levels and patterns in big cities in comparison to other residential contexts.

The causes of spatial fertility variation

The idea of *compositional factors* suggests that fertility levels vary between places because different people live in different settlements. First, it is a well-known fact that the share of highly educated people is larger in cities than in small towns and rural areas. Fertility levels tend to differ by education level, with the lowest for university-educated individuals and the highest for individuals with only compulsory education (Hoem 2005). Therefore, lower fertility in larger places might simply be attributed to the higher proportion of highly educated people living there. Educational composition may thus be an important determinant of urban-rural fertility variation in many countries. It is also likely that the role of education in urban-rural fertility differences varies between countries – it may be bigger in the countries where differences in fertility levels by education level are larger (e.g., Great Britain or Germany) and smaller in the countries where fertility levels vary little by level of education (e.g., the Nordic countries) (Hoem 2005). Second, fertility variation by residence may also result from the larger share of students in cities and towns than in small towns and rural areas (Kulu et al. 2007). Previous research shows that the likelihood of family formation is very small during the studies. Third, the share of married people is larger in rural areas and small towns than in large cities and marriage is related to childbearing. Thus, the over-representation of married people in smaller places may explain the higher fertility rates there, particularly the higher likelihood of first birth. However, the direction of causality between marriage and fertility is not always that clear; it is possible that people decide to marry because they wish to have children.

Selective migrations may also account for variations in spatial fertility. Couples who intend to have a child (or another child) may move from larger places to smaller ones because the latter are perceived as better suited to raising children. Recent studies show that selective moves take place between cities and neighbouring rural areas, many of which can be classified as suburbs of cities (Kulu and Boyle 2009). However, the factor of selective migrations may be less relevant to explaining urban-rural fertility variation if the areas around cities and towns have been included in the analysis as part of the urban region. Previous studies have shown that there are families who move from cities and towns to small towns and rural areas over long distances, potentially with the intention of having another (or a third) child (Kulu 2008). However, the share of such migrants is usually not large.

The *context* may influence fertility behaviour through economic opportunities and constraints or cultural factors. It is a well known fact that children are more expensive in cities than in rural areas (Livi-Bacci and Breschi 1990; Becker 1991). First, food, commodities and services are more expensive in larger than in smaller places. Secondly, children are also expensive in cities because parents have to pay for post-school activities of their children (piano lessons, playing football etc). Third, children in cities are more time-consuming for their parents than those in rural areas; parents not only need to pay for post-school activities but also organise their children's journeys to and from home. Fourth, urban environments as such encourage higher spending on children because of norms, proximity to shops and other attractions and a need to invest more in children through extra-curriculum activities. Finally, opportunities costs are also higher in cities and towns than in small towns and rural areas (Becker 1991; Michielin 2004). Life in an urban context, particularly in large cities, offers various opportunities for work and leisure. Having children, however, means that the possibility of taking advantage of such opportunities is relatively small. Cultural factors may also explain urban-rural fertility variation. Research has shown that people in rural areas and small towns retain traditional attitudes and lifestyles, with a value orientation towards large families and a preference for extended families (Trovato and Grindstaff 1980; Heaton 1989; Snyder et al. 2004; Snyder 2006).

Daily social interaction may also play a role. Smaller places are usually considered as family-friendly environments because of low population density and their vicinity to nature. Residents in these areas are more likely to be surrounded by families with children because of higher fertility there and the residential moves of families with children from larger settlements. Demographic processes may thus not only reinforce local cultural values for large families, but also create a context where social interaction encourages people to have a child (or another) child.

Data and definitions

Our data come from the two sources: the Office of National Statistics (ONS) birth statistics and the British Household Panel Survey (BHPS). The ONS data provide us with information, first, on the number of births by age of mother across local authority districts (LAD) for 2011, and second, on female population by age at the 2011 UK census. We use the data to calculate the total fertility (TFR) for 2011. We also considered the calculation of fertility trends by local authority districts over years. However, it turned out that it is not possible to obtain unbiased fertility estimates until revised population figures for the period between two recent censuses (2001 and 2011) become available. Our calculations based on initial population estimates showed relatively high fertility for London and somewhat lower than expected fertility levels for rural areas in the pre-2011 census years. We believe that this was largely due to undercount of immigrant population in the capital city of London and undercount of young adults (women) who leave rural areas and small towns for cities for studies.

We use data from the British Household Panel Survey (BHPS) to calculate parity-specific fertility rates across various residential contexts with and without controlling for a number of socioeconomic variables and to investigate the impact of selective residential moves and migrations. The BHPS is an annual survey consisting of a nationally representative sample of about 5,500 households recruited in 1991, containing a total of approximately 10,000 individuals. The sample is a stratified clustered design drawn from 250 areas of Great Britain, and all residents present at those addresses at the first wave of the survey were designated as panel members. The BHPS collects annual information on major life events of individuals, including union formation and dissolution, birth of children, and residential change. Additionally, in 1992, completed fertility, partnership, educational and employment histories of the respondents were collected. The extract we use includes women aged 16–49 between 1991 and 2008. We focus on the childbearing of those women by residential context.

We study the impact of residential context on first, second and third births. We distinguish six types of areas according to the size of the local authority district and its population density: 1) the capital city of London; 2) other large cities with a population of more than 400,000 (large cities); 3) cities with 200,000–400,000 inhabitants (cities); 4) local authority areas with less than 200,000 inhabitants, but with population density of 250 or more individuals per km^2 (towns); 5) local authority areas with less than 200,000 inhabitants and with population density of 100–250 individuals per km^2 (small towns); and 6) areas with less than 200,000 inhabitants and with less than 100 individuals per km^2 (rural areas). Additionally, we distinguish between central cities and suburban areas for cities and towns with more than 200,000 people. A local authority area is assigned to an urban centre if at least 15% of its employed population commuted there in 2001. Using commuting data to define 'travel-to-work' or labour-market regions is standard in migration and urbanisation research, although the threshold used varies across studies (see Champion 2001; Hugo et al. 2003). We have experimented with different thresholds (15%, 20% and 30%). As expected the fertility differences between the urban regions are the largest when using the criteria of 30% and the smallest with the threshold of 15% (used in the current analysis).

Methods and modelling strategy

We first calculate the total fertility (TFR) for various residential contexts. We then use event-history analysis to calculate parity-specific birth rates (for the first three transitions) (Hoem 1987). We model the time to conception (subsequently leading to a birth) to measure the effect of the place of residence on childbearing decisions as precisely as possible. The basic model can be formalised as follows:

$$\ln \mu_i(t) = \ln \mu_0(t) + \sum_j \alpha_j x_{ij} + \sum_l \beta_l w_{il}(t), \qquad (1)$$

where $\mu_i(t)$ denotes the hazard of the first, second or third conception for individual *i* and $\ln\mu_0(t)$ denotes the baseline log-hazard, which we specify as a piecewise linear spline (age for first birth or time since previous birth for the second and third births). x_{ij} represents the values for a time-constant variable, and $w_{il}(t)$ represents a time-varying variable. We also include in the model a woman-level residual (random effect) to control for unmeasured time-invariant characteristics that influence her fertility behaviour. The model is as follows:

$$\begin{aligned}
\ln\mu_i^{B1}(t) &= \ln\mu_0^{B1}(t) + \sum_j \alpha_j^{B1} x_{ij} + \sum_l \beta_l^{B1} w_{il}(t) + \varepsilon_i^B \\
\ln\mu_i^{B2}(t) &= \ln\mu_0^{B2}(t) + \sum_j \alpha_j^{B2} x_{ij} + \sum_l \beta_l^{B2} w_{il}(t) + \varepsilon_i^B \quad (2) \\
\ln\mu_i^{B3}(t) &= \ln\mu_0^{B3}(t) + \sum_j \alpha_j^{B3} x_{ij} + \sum_l \beta_l^{B3} w_{il}(t) + \varepsilon_i^B
\end{aligned}$$

where ε_i^B is residual for woman *i*; the residuals are assumed to follow a normal distribution.

In our modelling strategy, we investigate first, second and third birth risk by residential context controlling for basic demographic characteristics: the *woman's age* or *time since previous birth* and *calendar time*. We then also control for socio-economic characteristics of women to explore to what extent do these characteristics explain fertility variation by residential context. We include in the models *educational level* (low, medium or high) of the woman and her *activity status* (self-employed, full-time employed, part-time employed, in education, unemployed or other activity) and *ethnicity/race* (white or other). We also include in the models *partnership status* (in union or out of union) and the woman's *age at first birth* (for second and third birth models). Finally, we control for *residential moves* (residential changes within a labour market area) and *migrations* (moves between labour market areas) and a woman's *unmeasured time-invariant characteristics*.

Total fertility by residential context

We calculated the total fertility (TFR) for local authority districts of England and Wales with different size and density. We see that the larger the county, the smaller was the total fertility (Figure 1). While the total fertility for small towns and rural areas varied between 2.2 to 2.3 in 2011, the total fertility for city regions and towns was between 1.9 and 1.95; the total fertility for London region was about 1.8. Next, we distinguished between the city centres and suburbs. We see that suburbs had significantly higher fertility levels than the city centres (Figure 2). The difference was particularly pronounced for London; the total fertility in the city centre was about 1.5, whereas the figure for suburbs was 2.0.

Next, we investigated the contribution of first-, second- and third-birth rates to fertility variation by residential context and examined to what extent did the socio-economic characteristics of women and selective migrations explain spatial fertility variation. We combined residential categories into three groups: London, other cities and towns, small towns and rural areas (Table 1). This was necessary due to a small sample size in some residential categories. However, for London we distinguished between the central city and suburbs of the city as the fertility levels significantly varied between these contexts.

Parity-specific fertility by residential context

First birth

In the first model, we only controlled for the woman's age and calendar period. Women living in central London had a significantly lower risk of a first birth than those in the city's suburbs or in other urban regions (Table 2, Model 1). The highest risk was observed for women living in rural areas and small towns. In the second and third models, we also controlled for the socio-economic characteristics of women and their partnership status. The differences between residential contexts decreased, but remained significant between urban and rural areas; women in small towns and rural areas had 20% higher risk of first birth than those living in cities and towns. The analysis revealed that the differences in partnership status explained much of the initial fertility differences between central London and other areas; a relatively large share of single women in central London was responsible for low first birth rates there, which was not surprising. In the fourth model, we also included the mover status to control for the effect of selective residential moves and migrations. We observed no differences in the first-birth risks between movers and non-movers. In the final model, we additionally controlled for unobserved time-invariant characteristics of women. The fertility differences between residential contexts persisted – women in small towns and rural areas had a significantly higher risk of first birth than those living in urban areas.

Second birth

In the first model, we controlled for time since first birth and calendar period. Interestingly, we observed no differences in second-birth risk by residential context (Table 3, Model 1). Estimated second-birth rate was smaller for women living in central London, but the sample size was not large enough to detect significant differences between the residential contexts.

Next, we also controlled for the socio-economic characteristics of women, their mover status and unmeasured characteristics. The patterns did not change much. Therefore, while first-birth rates significantly differed by residential context, there were no such differences in the second-birth rates. Interestingly, however, women who moved from one region to another had significantly higher second-birth rates than those who did not move suggesting that selective migration was indeed in operation (Table 3, Model 4). Our further analysis of the timing of fertility relative to moving supported that observation; the fertility levels were relatively high during the first year after the move to a new region suggesting that couples with childbearing intentions moved to places that are better suited to childrearing (results not shown). The general patterns did not change, however, because of the small share of (selective) migrants.

Third birth

The patterns for third births were also interesting. Women living in rural areas and small towns had a significantly higher risk of third birth that those in cities and town (Table 4, Model 1). Interestingly, estimated third-birth rate was also relatively high for women living in London (the central city and suburbs combined), but again the sample size was not large enough to detect significant differences. Next, we controlled for the socio-economic characteristics of women; the differences in the third birth rates between residential contexts remained. We then also included in the analysis the woman's age at first birth. The differences between small towns and rural areas and between cities and towns persisted; interestingly, however, the third birth rate was now also relatively high in London. This suggests that lower higher-order birth rates in London region might be related to the late start of childbearing there. Finally, we also included in the model the mover status. Women who had changed their region of residence had a significantly higher risk of a third birth than did women who had not moved from one area to another, showing that selective migration was in operation for third births as well (Table 4, Model 4). However, the patterns did not change much because of the small share of (selective) migrants. Further analysis of the timing of fertility relative to moving showed relatively high third-birth rates during the first year after the move suggesting that couples moved in order to find a better living environment for their growing family (results not shown).

Summary and discussion

In this study, we examined fertility variation by residential context in Britain. We analysed fertility variation across regions with different size and within urban regions by distinguishing between central cities and suburbs of the cities. This is the first study outside Nordic countries to provide such a detailed analysis of fertility by residential context. Our analysis of vital statistics showed that the total fertility declined as the size of an urban area increased; within urban regions suburbs had significantly higher fertility levels than the city centres. The analysis of individual-level longitudinal data showed a significant variation in the first- and third-birth rates by residential context, but no variation in the second-birth levels. First-birth levels were low in the capital city of London, whereas the first- and third-birth rates were high in rural areas and small towns. Further analysis revealed that the socioeconomic characteristics of women explained some fertility variation by residential context. We also observed elevated fertility for couples moving from one area to another suggesting that some couples with childbearing intentions moved to places that are better suited to childrearing. However, selective migrations did not explain any of the variation in spatial fertility as the share of internal migrants was small.

We observed significant fertility variation by residential context after controlling for compositional characteristics and selective migrations suggesting that there were contextual effects. However, there are some arguments, which suggest that further control for compositional characteristics may have explained fertility variation by residential context. First, we included in the models women's education and employment status, but failed to control for her partner's education and employment status. We are confident that the inclusion of partner's characteristics would have not changed the results much; recent research on Britain has showed no effect of partner's characteristics on spatial variation in first-birth risks (Fiori et al. 2012). Second, we did not include housing type and characteristics in the models; it could be argued that different housing structure explained observed fertility variation by residential context. We did include housing type and tenure in our preliminary analysis – interestingly, their effect on spatial fertility variation was negligible. We decided to exclude housing characteristics from the further analysis, mostly because the direction of causality between housing and childbearing is far from clear. Some variables that explained fertility variation by residential context could have been excluded from the analysis. For example, we showed that a relatively large share of unmarried women in central London was responsible for low first-birth rates there; once we included partnership status in the models, the differences between the first-birth rates in London and elsewhere decreased. However, the question arises why people were less likely to marry and have a child in some contexts (large cities) than in others (rural areas and small towns). The answer might lie in contextual factors.

We acknowledge some issues related to the comparison of the results of the analysis of vital statistics and those of the BHPS individual-level data. First, immigrants were included in the calculation of the total fertility by residential context in 2011. Previous studies have shown high fertility levels for immigrants to European countries, mostly because of marriage migration or family re-unification (Milewski 2007). Contemporary labour migrants, in turn, may have relatively low fertility levels. However, it is not clear how different migrant groups were spatially distributed in the UK and how did this influence fertility levels by residential context. The BHPS data included immigrants who were present at the first wave in 1991, but excluded those who arrived later. Therefore the parity-specific analysis was based on the UK-born population and pre-1991 immigrants. Second, the analysis of fertility by birth order was based on information from the period of 1991 to 2008, whereas information on the total fertility by residential context came from 2011; this was the only time-point we had reliable data about female population in Britain. We considered the calculation of fertility trends by local authority districts over years. However, our analysis showed that flow statistics under-estimated female population in large cities and over-estimated it in rural areas and small town. Revised figures on female population by local authority district from 2001 to 2011 should become available in the future.

This study showed that fertility levels vary significantly by residential context in Britain. While fertility levels are low in large cities, they are high in small towns and rural areas. High fertility in remote rural areas would not be surprising even for a low-fertility country; however, given that almost one third of British population live in areas that were classified in this study as 'small towns and rural areas' the results of the study need some attention. Critics may argue that high fertility currently observed in smaller places is a temporary phenomenon related to the end of fertility postponement. However, similar patterns have been found in Nordic countries for a longer period, which suggests that the story is not that simple. The future research should also examine fertility patterns in large cities. Our analysis showed heterogeneity in fertility patterns in London; while some women remained childless, some had large families, although the sample was too small to detect the precise patterns. This study supported the need to go beyond the national averages and examine spatial fertility variation. Fertility levels vary significantly by residential context and compositional factors and selective migrations, usually seen as the main causes of spatial fertility variation, explain only a small part of this variation.

References

Becker, G. S. 1991. *A Treatise on the Family*. Second Edition. Cambridge: Harvard University Press.

Brunetta, G. and G. Rotondi. 1991. Urban and rural fertility in Italy: regional and temporal changes, in J. Bähr and P. Gans (eds.), *The Geographical Approach to Fertility*. Kieler Geographische Schriften 78. Kiel: Geographisches Institut der Universität Kiel, pp. 203–217.

Burcin, B. and T. Kučera. 2000. Changes in fertility and mortality in the Czech Republic: an attempt of regional demographic analysis, in T. Kučera, O. Kučerová, O. Opara and E. Schaich (eds.), *New Demographic Faces of Europe*. Berlin: Springer, pp. 371–417.

Champion, A. G. 2001. Urbanization, sub-urbanization, counterurbanization, and reurbanization, in R. Paddison (ed.), *Handbook of Urban Studies*. London: Sage, pp. 143–161.

De Beer, J. and I. Deerenberg. 2007. An explanatory model for projecting regional fertility differences in the Netherlands, *Population Research and Policy Review* 26:511–528.

Fagnani, J. 1991. Fertility in France: the influence of urbanization, in J. Bähr and P. Gans (eds.), *The Geographical Approach to Fertility*. Kieler Geographische Schriften 78. Kiel: Geographisches Institut der Universität Kiel, pp. 165–173.

Fiori, F., E. Graham and Z. Feng. 2012. Geographical context and first birth in Britain. Paper presented at International Conference on Fertility over the Life Course, 12–13 September 2012, University of Bremen.

Glusker, A. I., S. A. Dobie, D. Madigan, R. A. Rosenblatt and E. H. Larson. 2000. Differences in fertility patterns between urban and rural women in Washington State, 1983–1984 to 1993–1994, *Women & Health* 31(1): 55–70.

Hank, K. 2001. Regional fertility differences in Western Germany: an overview of the literature and recent descriptive findings, *International Journal of Population Geography* 7(4): 243–257.

Heaton, T. B., D. T. Lichter and A. Amoateng. 1989. The timing of family formation: rural-urban differentials in first intercourse, childbirth, and marriage, *Rural Sociology* 54(1): 1–16.

Hoem J. M. 1987. Statistical analysis of a multiplicative model and its application to the standardization of vital rates: a review, *International Statistical Review* 55(2): 119–152.

Hoem, J. M. 2005. Why does Sweden have such high fertility?, *Demographic Research* 13(22), 559–572.

Hugo, G., A. Champion and A. Lattes. 2003. Toward a new conceptualization of settlements for demography, *Population and Development Review* 29(2): 277–297.

Kulu, H. 2005. Migration and fertility: competing hypotheses re-examined, *European Journal of Population* 21(1): 51–87.

Kulu, H. 2006. Fertility of internal migrants: comparison between Austria and Poland, *Population, Space and Place* 12(3): 147–170.

Kulu, H. and P. J. Boyle. 2009. High fertility in city suburbs: compositional or contextual effects? *European Journal of Population* 25(2): 157–174.

Kulu, H., P. J. Boyle and G. Andersson. 2009. High fertility in city suburbs: evidence from four Northern European countries. *Demographic Research* 21(31): 915–944.

Kulu, H. and A. Vikat. 2007. Fertility differences by housing type: the effect of housing conditions or of selective moves?, *Demographic Research* 17(26): 775–802.

Kulu, H., A. Vikat and G. Andersson. 2007. Settlement size and fertility in the Nordic countries, *Population Studies* 51(3): 265–285.

Kupiszewski, M., E. Heikkila, M. Nieminen, H. Durham, P. Rees and D. Kupiszewska. 2000. Internal migration and regional population dynamics in Europe: Finland case study, Working Paper 00/07. Leeds: The University of Leeds, School of Geography.

Lillard, L. A. and C. W. A. Panis. 2003. *aML Multilevel Multiprocess Statistical Software, Version 2.0*. Los Angeles: EconWare.

Livi-Bacci, M. L. and M. Breschi.1990. Italian fertility: an historical account, *Journal of Family History* 15(4): 385–408.

Michielin, F. 2004. Lowest low fertility in an urban context: the role of migration in Turin, Italy, *Population, Space and Place* 10(4): 331–347.

Milewski, N. 2007. First child of immigrant workers and their descendants in West Germany: Interrelation of events, disruption, or adaptation?, *Demographic Research* 17(29): 859–896.

Mulder, C. and M. Wagner. 2001. The connection between family formation and first-time home ownership in the context of West Germany and the Netherlands, *European Journal of Population* 17(2): 137–164.

Snyder, A. R. 2006. The role of contemporary family behaviors in nonmarital conception outcomes of nonmetro women: comments on Albrecht and Albrecht (2004), *Rural Sociology* 71(1): 155–163.

Snyder, A. R., S. L. Brown and E. P. Condo. 2004. Residential differences in family formation: the significance of cohabitation, *Rural Sociology* 69(2): 235–260.

Thygesen, L. C., L. B. Knudsen and N. Keiding. 2005. Modelling regional variation of first-time births in Denmark 1980–1994 by an age-period-cohort model, *Demographic Research* 13(23): 573–596.

Tromans, N., E. Natamba and J. Jefferies. 2009. Have women born outside the UK driven the rise in UK births since 2001?, *Population Trends* 136: 28–42.

Trovato, F., and C. F. Grindstaff. 1980. Decomposing the urban-rural fertility differential: Canada, 1971, *Rural Sociology* 45(3): 448–468.

Vitali, A., and F. C. Billari. 2011. A spatial panel analysis of Italian regional fertility. Paper presented at the Annual Meeting of the PAA, Washington, DC.

Vojtěchovská, P. 2000. Population development in Poland, in T. Kučera, O. Kučerová, O. Opara and E. Schaich (eds.), *New Demographic Faces of Europe*. Berlin: Springer, pp. 247–266.

Zakharov, S. V. and E. I. Ivanova. 1996. Regional fertility differentiation in Russia: 1959–1994, *Studies on Russian Economic Development* 7(4): 354–368.

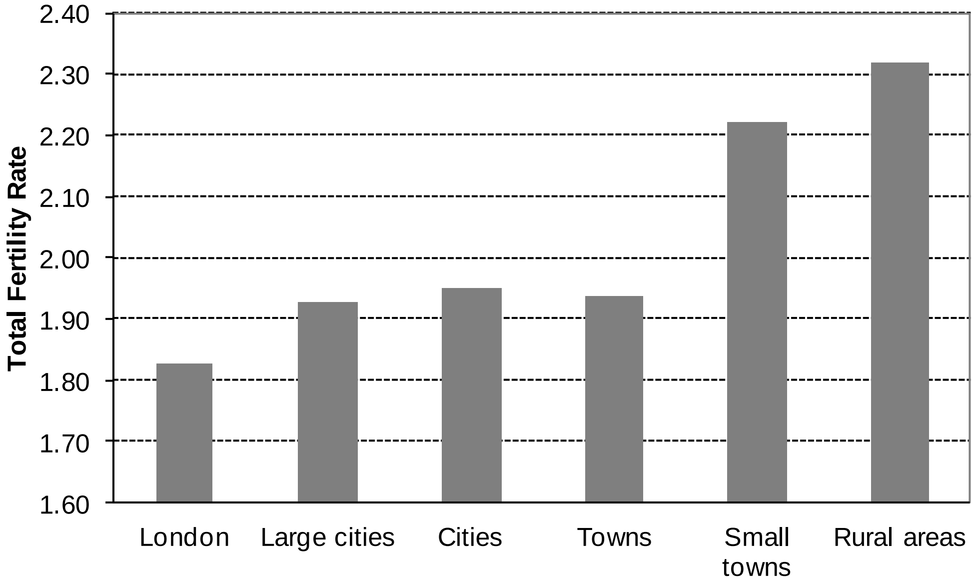

Figure 1. TFR by Residential Context in England and Wales, 2011.

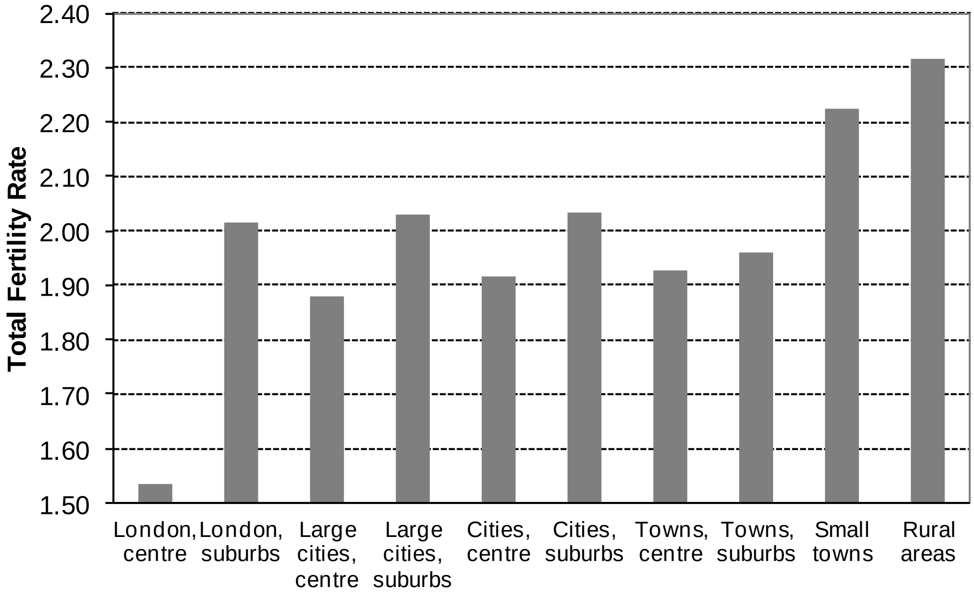

Figure 2. TFR by Residential Context in England and Wales, 2011.

Table 1: Person-years and Births by Place of Residence.

	Person-years		Births	
	Number	Percent	Number	Percent
First birth				
London	33209.84	17	119	15
Other cities and towns	76998.51	40	311	39
Rural areas and small towns	63873.18	33	291	37
Scotland	16767.67	9	72	9
Total	190849.20	100	793	100
Second birth				
London	9797.67	12	87	13
Other cities and towns	30989.00	39	257	38
Rural areas and small towns	30858.50	39	268	39
Scotland	8252.33	10	67	10
Total	79897.49	100	679	100
Third birth				
London	13736.17	9	30	10
Other cities and towns	61428.49	41	112	36
Rural areas and small towns	62192.08	42	140	45
Scotland	12163.67	8	28	9
Total	149520.40	100	310	100

Source: Calculations based on the BHPS data.

Table 2: Log-risks of Conception Leading to First Birth (Parameter Estimates and Standard Errors).

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Place of residence					
London central city	-0.606 ***	-0.458 **	-0.182	-0.180	-0.178
	(0.227)	(0.230)	(0.206)	(0.205)	(0.224)
London suburbs	-0.049	0.009	0.014	0.006	0.000
	(0.121)	(0.125)	(0.119)	(0.119)	(0.133)
Other cities and towns	0	0	0	0	0
Small towns and rural areas	0.185 **	0.206 ***	0.179 **	0.185 **	0.194 **
	(0.082)	(0.080)	(0.081)	(0.082)	(0.091)
Scotland	0.022	0.030	0.086	0.080	0.061
	(0.138)	(0.127)	(0.134)	(0.135)	(0.150)
Demographic variables					
Age (baseline)					
Constant	-3.875 ***	-4.175 ***	-1.823 ***	-1.852 ***	-1.965 ***
	(0.220)	(0.277)	(0.301)	(0.304)	(0.318)
-20 years (slope)	0.162 **	0.070	-0.014	-0.015	0.000
	(0.066)	(0.069)	(0.070)	(0.070)	(0.071)
20-24 years (slope)	0.036	-0.004	-0.196 ***	-0.194 ***	-0.195 ***
	(0.032)	(0.033)	(0.034)	(0.034)	(0.035)
25-29 years (slope)	0.172 ***	0.166 ***	0.083 ***	0.083 ***	0.092 ***
	(0.030)	(0.031)	(0.031)	(0.031)	(0.033)
30-34 years (slope)	-0.077 **	-0.077 **	-0.060 *	-0.060 *	-0.044
	(0.035)	(0.035)	(0.036)	(0.036)	(0.037)
35+ years (slope)	-0.320 ***	-0.350 ***	-0.372 ***	-0.371 ***	-0.388 ***
	(0.047)	(0.047)	(0.047)	(0.048)	(0.048)
Partnership status					
Single			-2.467 ***	-2.448 ***	-2.569 ***
			(0.116)	(0.121)	(0.129)
Cohabiting			-1.066 ***	-1.061 ***	-1.151 ***
			(0.097)	(0.098)	(0.106)
Married			0	0	0
Separated			-1.539 ***	-1.534 ***	-1.640 ***
			(0.157)	(0.157)	(0.162)
Socio-economic variables					
Period					
1991-94	0.203 **	0.184 *	0.078	0.092	0.055
	(0.100)	(0.101)	(0.102)	(0.108)	(0.112)
1995-99	0	0	0	0	0
2000-04	0.022	0.026	0.204 **	0.208 **	0.231 **
	(0.093)	(0.095)	(0.097)	(0.097)	(0.102)
2005-08	-0.050	0.060	0.310 ***	0.315 ***	0.372 ***
	(0.111)	(0.117)	(0.119)	(0.120)	(0.130)

Ethnic minority								
No	0		0		0		0	
Yes	0.418	***	0.370	**	0.369	*	0.405	**
	(0.158)		(0.187)		(0.189)		(0.202)	
Educational level								
Low	0.254	***	0.378	***	0.376	***	0.379	***
	(0.087)		(0.087)		(0.087)		(0.100)	
Medium	0		0		0		0	
High	0.088		0.155		0.172		0.120	
	(0.111)		(0.103)		(0.108)		(0.121)	
Activity status								
Self-employed	0.112		0.075		0.069		0.107	
	(0.234)		(0.217)		(0.216)		(0.228)	
Full-time employed	0		0		0		0	
Part-time employed	0.694	***	0.598	***	0.600	***	0.630	***
	(0.116)		(0.110)		(0.111)		(0.119)	
Enrolled in education	-1.292	***	-1.117	***	-1.109	***	-1.083	***
	(0.201)		(0.202)		(0.203)		(0.205)	
Unemployed	0.857	***	0.929	***	0.930	***	0.984	***
	(0.145)		(0.149)		(0.149)		(0.154)	
Other	1.668	***	1.530	***	1.530	***	1.650	***
	(0.083)		(0.083)		(0.084)		(0.096)	
Activity missing	0.080		0.279		0.286		0.286	
	(0.386)		(0.407)		(0.402)		(0.418)	
Mover status								
Non-mover					0		0	
Mover					0.073		0.108	
					(0.091)		(0.099)	
Migrant					-0.047		-0.045	
					(0.114)		(0.123)	

Source: Calculations based on the BHPS data.
Significance: '*'=10%; '**'=5%; '***'=1%.
Notes: For linear splines we present slope estimates which show how the log-hazard increases or decreases over a certain duration.

Table 3: Log-risks of Conception Leading to Second Birth (Parameter Estimates and Standard Errors).

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
Place of residence										
London central city	-0.222		-0.111		-0.037		-0.035		-0.064	
	(0.275)		(0.294)		(0.293)		(0.289)		(0.316)	
London suburbs	-0.038		-0.035		0.020		0.017		0.018	
	(0.143)		(0.145)		(0.144)		(0.144)		(0.162)	
Other cities and towns	0		0		0		0		0	
Small towns and rural areas	-0.013		-0.007		-0.006		-0.015		-0.018	
	(0.087)		(0.085)		(0.088)		(0.089)		(0.098)	
Scotland	-0.080		-0.071		-0.096		-0.099		-0.090	
	(0.144)		(0.143)		(0.143)		(0.144)		(0.158)	
Demographic variables										
Time since first birth (baseline)										
Constant	-3.168	***	-3.502	***	-3.489	***	-3.579	***	-3.932	***
	(0.253)		(0.382)		(0.389)		(0.387)		(0.426)	
0-1 years (slope)	2.075	***	2.147	***	2.139	***	2.143	***	2.216	***
	(0.283)		(0.289)		(0.291)		(0.292)		(0.295)	
1-3 years (slope)	-0.055		0.013		0.016		0.019		0.100	
	(0.073)		(0.074)		(0.074)		(0.075)		(0.078)	
3-5 years (slope)	-0.463	***	-0.410	***	-0.396	***	-0.393	***	-0.357	***
	(0.087)		(0.088)		(0.088)		(0.088)		(0.090)	
5-10 years (slope)	-0.260	***	-0.252	***	-0.255	***	-0.252	***	-0.251	***
	(0.055)		(0.057)		(0.058)		(0.058)		(0.058)	
10+ years (slope)	-0.341	***	-0.338	***	-0.348	***	-0.344	***	-0.358	***
	(0.092)		(0.092)		(0.093)		(0.093)		(0.093)	
Partnership status										
In union			0		0		0		0	
Out of union			-0.971	***	-1.094	***	-1.083	***	-1.213	***
			(0.116)		(0.118)		(0.119)		(0.126)	
Age at first birth										
-20 years					0.163		0.180		0.181	
					(0.135)		(0.136)		(0.150)	
20-24 years					0		0		0	
25-29 years					-0.048		-0.049		-0.039	
					(0.107)		(0.107)		(0.120)	
30+ years					-0.537	***	-0.527	***	-0.509	***
					(0.114)		(0.115)		(0.127)	

Socio-economic variables									
Period									
1991-94	-0.075	-0.051		-0.080		-0.027		-0.017	
	(0.111)	(0.112)		(0.112)		(0.118)		(0.123)	
1995-99	0	0		0		0		0	
2000-04	-0.044	-0.029		-0.005		-0.021		-0.021	
	(0.102)	(0.103)		(0.103)		(0.104)		(0.110)	
2005-08	-0.164	-0.138		-0.108		-0.138		-0.121	
	(0.120)	(0.121)		(0.122)		(0.123)		(0.131)	
Ethnic minority									
No		0		0		0		0	
Yes		-0.014		0.135		0.144		0.171	
		(0.275)		(0.277)		(0.270)		(0.304)	
Educational level									
Low		-0.098		-0.103		-0.099		-0.095	
		(0.098)		(0.100)		(0.101)		(0.112)	
Medium		0		0		0		0	
High		0.223	**	0.382	***	0.355	***	0.385	***
		(0.113)		(0.120)		(0.123)		(0.138)	
Activity status									
Self-employed		0.126		0.170		0.156		0.177	
		(0.231)		(0.235)		(0.233)		(0.249)	
Full-time employed		0		0		0		0	
Part-time employed		0.226	*	0.216	*	0.207	*	0.270	**
		(0.117)		(0.119)		(0.119)		(0.128)	
Enrolled in education		-0.169		-0.319		-0.335		-0.297	
		(0.372)		(0.379)		(0.379)		(0.391)	
Unemployed		0.718	***	0.577	***	0.564	***	0.673	***
		(0.180)		(0.182)		(0.184)		(0.200)	
Other		0.637	***	0.585	***	0.575	***	0.674	***
		(0.101)		(0.104)		(0.104)		(0.112)	
Activity missing		1.105	**	1.060	**	1.092	**	1.186	**
		(0.514)		(0.471)		(0.467)		(0.480)	
Mover status									
Non-mover						0		0	
Mover						0.078		0.074	
						(0.100)		(0.107)	
Migrant						0.216	*	0.230	*
						(0.116)		(0.127)	

Source: Calculations based on the BHPS data.
Significance: '*'=10%; '**'=5%; '***'=1%.
Notes: For linear splines we present slope estimates which show how the log-hazard increases or decreases over a certain duration.

Table 4: Log-risks of Conception Leading to Third Birth (Parameter Estimates and Standard Errors).

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
Place of residence										
London	0.123		0.113		0.363	*	0.420	*	0.441	*
	(0.205)		(0.208)		(0.214)		(0.217)		(0.230)	
Other cities and towns	0		0		0		0		0	
Small towns and rural areas	0.248	*	0.238	*	0.282	**	0.242	*	0.252	*
	(0.129)		(0.129)		(0.131)		(0.132)		(0.140)	
Scotland	0.132		0.187		0.187		0.137		0.130	
	(0.211)		(0.213)		(0.215)		(0.217)		(0.230)	
Demographic variables										
Time since second birth (baseline)										
Constant	-3.805	***	-4.002	***	-3.743	***	-3.925	***	-4.244	***
	(0.379)		(0.709)		(0.798)		(0.841)		(0.871)	
0-1 years (slope)	1.258	***	1.315	***	1.342	***	1.356	***	1.405	***
	(0.423)		(0.434)		(0.435)		(0.437)		(0.439)	
1-3 years (slope)	0.018		0.059		0.086		0.099		0.143	
	(0.119)		(0.121)		(0.121)		(0.122)		(0.123)	
3-5 years (slope)	-0.391	***	-0.351	***	-0.345	***	-0.335	***	-0.311	***
	(0.112)		(0.114)		(0.114)		(0.115)		(0.116)	
5-10 years (slope)	-0.275	***	-0.265	***	-0.268	***	-0.261	***	-0.254	***
	(0.061)		(0.062)		(0.062)		(0.062)		(0.063)	
10+ years (slope)	-0.233	***	-0.237	***	-0.260	***	-0.259	***	-0.263	***
	(0.063)		(0.064)		(0.064)		(0.064)		(0.064)	
Partnership status										
In union			0		0		0		0	
Out of union			-0.276		-0.603	***	-0.595	***	-0.637	***
			(0.183)		(0.191)		(0.193)		(0.200)	
Age at first birth										
-20 years					0.772	***	0.767	***	0.829	***
					(0.152)		(0.153)		(0.165)	
20-24 years					0		0		0	
25-29 years					-0.520	***	-0.503	***	-0.511	***
					(0.154)		(0.154)		(0.162)	
30+ years					-1.011	***	-1.031	***	-1.089	***
					(0.228)		(0.227)		(0.237)	
Socio-economic variables										
Period										
1991-94	0.140		0.084		0.005		0.113		0.157	
	(0.148)		(0.151)		(0.152)		(0.165)		(0.170)	
1995-99	0		0		0		0		0	
2000-04	-0.290	*	-0.268	*	-0.323	**	-0.383	**	-0.415	**
	(0.157)		(0.158)		(0.162)		(0.162)		(0.167)	
2005-08	-0.167		-0.136		-0.152		-0.270		-0.302	
	(0.185)		(0.193)		(0.192)		(0.197)		(0.203)	

Ethnic minority								
No	0		0		0		0	
Yes	-0.027		-0.095		-0.137		-0.124	
	(0.583)		(0.689)		(0.739)		(0.766)	
Educational level								
Low	0.022		-0.126		-0.068		-0.084	
	(0.152)		(0.151)		(0.152)		(0.160)	
Medium	0		0		0		0	
High	-0.285		0.005		-0.022		-0.018	
	(0.198)		(0.204)		(0.204)		(0.214)	
Activity status								
Self-employed	0.261		0.395		0.360		0.378	
	(0.269)		(0.267)		(0.265)		(0.271)	
Full-time employed	0		0		0		0	
Part-time employed	-0.318	*	-0.276		-0.286		-0.270	
	(0.186)		(0.186)		(0.186)		(0.193)	
Enrolled in education	-0.571		-0.681		-0.723		-0.800	
	(0.821)		(0.856)		(0.871)		(0.929)	
Unemployed	0.729	**	0.521	*	0.448		0.416	
	(0.292)		(0.295)		(0.298)		(0.307)	
Other	0.467	***	0.439	**	0.442	**	0.475	***
	(0.171)		(0.172)		(0.173)		(0.181)	
Activity missing	0.481		0.651		0.703		0.797	
	(0.563)		(0.581)		(0.578)		(0.587)	
Mover status								
Non-mover					0		0	
Mover					0.173		0.151	
					(0.147)		(0.154)	
Migrant					0.622	***	0.618	***
					(0.179)		(0.187)	
Standard deviation of residuals								
Fertility							0.509	***
							(0.070)	

Source: Calculations based on the BHPS data.
Significance: '*'=10%; '**'=5%; '***'=1%.
Notes: For linear splines we present slope estimates which show how the log-hazard increases or decreases over a certain duration.