Why Fertility Levels Vary between Urban and Rural Areas: The Effect of Population Composition, Selective Migrations, Housing Conditions or Contextual Factors?

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While many studies show a persistent urban-rural fertility variation in industrialised countries, the causes of this variation have been little investigated. Using rich longitudinal register data from Finland, we examine the relative contribution of socio-economic characteristics of population, selective migrations, housing conditions and contextual factors to fertility variation across settlements. Our analysis shows that fertility levels are the highest in small towns and rural areas and the lowest in the capital city, as expected. Socio-economic characteristics of women and selective migrations account for only a small portion of fertility variation across settlements, whereas housing conditions explain a significant portion of urban-rural fertility variation. A significant spatial fertility variation after controlling for housing conditions suggests that there are also contextual effects. We discuss the role of various contextual characteristics in explaining urban-rural fertility variation including direct and indirect costs of raising children, spread of voluntary childlessness in cities and 'family-oriented' subcultures in rural areas and small towns.

Keywords: fertility, urban, rural, event history analysis, Finland

Introduction

Spatial fertility variation was a long time under-researched topic in the literature on low fertility in industrialised countries. However, recent literature has witnessed a growing interest in spatial aspects of fertility including urban-rural fertility differences (Hank 2001; 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), Germany and Austria (Hank 2001; Kulu 2006), the Nordic countries (Thygesen et al. 2005; Kulu et al. 2007), 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 the fertility levels are –, it is far from clear why fertility is higher in smaller places and lower in larger settlements. Most research discusses two competing hypotheses behind spatial fertility variation: compositional or contextual. *Compositional* suggests that fertility levels vary between places simply because different people live in different settlements, whereas *contextual* 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, which suit better for childrearing, whereas those with no childbearing plans may migrate to larger settlements.

Although previous research has shed considerable light on spatial aspects of fertility, we argue that it suffers from important shortcomings. First, most studies have used aggregate data and respective indices (ASFR, TFR), which have been useful to outline general patterns, but less so to find out the causes of urban-rural fertility variation. Second, urban-rural fertility variation has been a side-topic in those aforementioned studies that have examined disaggregated behavioural patterns using individual-level data. The causes of urban-rural fertility variation have been briefly discussed in these studies rather than thoroughly analysed. Third, the role of *housing conditions* in spatial fertility variation has not been examined.

Investigation of the causes of spatial fertility variation is important for demographic research. If the context turns out to be important determinant of childbearing patterns then research on urban-rural fertility variation would have a potential to significantly advance our understanding of causes of fertility patterns and dynamics in Europe and North America. If the composition of population plays a critical role then spatial fertility patterns and their dynamics might still be of interest for researchers working on regional population projections (de Beer and Deerenberg 2007; Wilson and Rees 2005). In this study, we examine the causes of urban-rural fertility variation. We go beyond traditional urban-rural dichotomy and distinguish settlement groups by the size of settlement. We investigate to what extent socio-economic characteristics of individuals explain fertility variation between various settlements and to what extent contextual factors play a role. Further, we also include in the analysis information on housing characteristics of couples and their residential histories to explore how much these factors account for fertility differences by settlement. This is an important step of analysis, which has not been executed in previous studies on urban-rural fertility variation. We use rich individual-level register data from Finland to examine separately patterns for first, second and third birth. Parity-specific analysis allows us to gain a better understanding of the causes of urban-rural fertility variation than conventional studies based on aggregate data and indicators.

Competing views on the causes of urban-rural fertility variation

The idea of *compositional* factors suggests that fertility levels vary between places because different people live in different settlements. First, it is well-known fact that the share of highly-educated people is larger in the cities than in small towns and rural areas. For many countries fertility levels tend to differ by educational level being lowest for university-educated and highest for individuals with only compulsory education (Hoem 2005). Therefore, lower fertility in larger places may simply be attributed to the fact that there are more highly-educated people living there. Educational composition may thus be an important determinant of urban-rural fertility variation in many countries, particularly for spatial differences in childlessness. 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 educational differences in fertility levels 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 fact that the share of students is larger in cities and towns than in small towns and rural areas (Hank 2001; Kulu et al. 2007). Previous research shows that the likelihood of family formation is very small during the studies, even though some variation exists in Europe, particularly between the East and the West.

Third, the share of married people is larger in smaller places and marriage is clearly related to childbearing. Thus over-representation of married people in small towns and rural areas may explain higher fertility there, particularly higher likelihood of family formation (Hank 2002). However, the direction of causality between marriage and childbearing is not as clear as it may appear at first glance. It can be argued that people often decide to marry because they wished to have children and the decision to start childbearing could be seen as a reason to give a more "legal form" to the relationship between the partners. This may be true even for the countries where childbearing in cohabitation is not (anymore) rare.

Selective migrations may also account for spatial fertility variation. Couples who intend to have a (or another) child may move from larger places to smaller ones as the latter are perceived to suit better for raising children. Indeed, recent studies show that selective moves take place between cities and neighbouring rural areas, many of which can be classified as suburbs of cities (Hank 2001; 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 a part of urban region. Previous studies show that there are families who move from cities and towns to small towns and rural areas over long distances, potentially with an intention of having another (or third) child, but the share of such couples is relatively small and the impact of such moves on urban-rural fertility variation is thus negligible (Kulu 2008).

The *context* may influence fertility behaviour through economic opportunities and constrains or cultural factors. It is well-known fact that children are more expensive in cities than in rural areas (Becker 1991). First, food, commodities and services are more expensive in larger than in smaller places. Second, we may also argue that children are expensive in cities because parents have to pay for each step of their children, be this sending the child to piano lessons after the school or playing football in a sport club. Third, children in cities are also more time-consuming for parents than those in rural areas, as parents do not only need to pay (or pay more) for the post-school activities, but also organise children's journeys from and to home. This may become an extremely difficult task for couples with many children, particularly if school, home and post-school activities are in different places, which is often the case in cities. Finally, one could argue that urban environment as such encourages more spending on children because of norms, proximity to the shops (and other attractions) and a need to invest more in children through extra curriculum activities. All these factors weight up marginally higher salaries in the urban context. The life in small towns and rural areas, in turn, is simpler: there are fewer attractions for children and less normative pressure for parents; children may even contribute to family economy, either assisting their parents in running a farm or family-based tourism enterprise.

Opportunities costs are also higher in cities and towns than in small towns and rural areas. The life in urban context, particularly in large cities offers various opportunities for work and leisure. Having children yet means that the possibility of taking advantage of these opportunities is relatively small. There is also a strong normative pressure for work-related achievements in cities, which may be further promoted by a stronger competition in cities. Briefly, there is more to lose (and win) in cities than in small towns and rural areas and this fact *per se* may constantly remind urban couples a dilemma between work or family. The emphasis on economic factors should not necessarily imply that childbearing decisions are subject to purely individual rational calculation in its instrumental form (maximisation of utility). Rather economic factors may be the basis for a normative context for various decisions including childbearing decisions – the context may discourage couples to have large families (in large cities) or encourage to have many children (in rural areas).

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, a value orientation towards large families and a preference for extended families. A rural and small-town population can thus be considered a 'family-oriented' sub-culture within a country. The 'family-oriented' sub-culture forms a normative context for the couples to draw upon when they make various decisions. Cities, in turn, are the places where the 'second' demographic transition began and spread; but not only – they also remain a stronghold of 'post-modern' values. Cities promote individual autonomy and self-actualisation, and thus individual choices, which, despite their variety, usually mean fewer children. There are also more heterogeneity in cities: while 'family-oriented' sub-culture may exist there, particularly in suburbs, cities are also places which support (or tolerate at least) the 'culture of singlehood and childlessness'.

While various compositional and contextual factors have received attention in the literature on spatial fertility variation, the role of *housing conditions* has been only briefly discussed. Housing type and size vary across residential contexts. Most people in rural areas and small towns live in detached or semi-detached houses, whereas in towns and large cities in particular apartments are the dominant type of housing. Fertility is higher in detached or semi-detached houses than in terraced houses or apartments (Kulu and Vikat 2007). The better and larger housing in smaller places may thus explain high fertility there. The issue, however, may not be as simple as it appears at first glance. On the one hand, high fertility in detached houses may indeed be related to the fact that detached houses are generally larger than apartments and often have a garden, which is very important for families with small children. On the other hand, it may be argued that selective residential moves of couples intending to have a child (or another child) may explain fertility differences between family houses and apartments. Still, interestingly, while the factor of selective moves may be of critical importance in explaining spatial fertility variation within settlements or regions, it likely plays a little role for urban-rural fertility variation when smaller settlements surrounding cities are considered as suburbs and included in the analysis as a part of the urban region. Couples often move to adjust their housing size to expected family size, but they usually move over short rather than long distances (Kulu 2008).

In this study we examine the relative contribution of socio-economic characteristics of population, housing conditions and contextual factors to fertility differences between various settlements. We also investigate the role of selective migrations in urban-rural fertility variation. We focus on the childbearing of partnered women. This is for two reasons. First, childbearing outside union is uncommon in the Nordic countries; if it occurs, it is mostly related to unplanned births to teenagers (cf. Vikat 2004), which is not the focus of this study.

Second, we investigate the contribution of housing conditions to spatial fertility variation. With a focus on childbearing in union we know with a relatively high precision housing conditions at the moment when a couple decided to have a child. We disaggregate fertility patterns by analysing separately determinants of spatial variation in first, second and third birth. We use individual-level register data, which allows us better than aggregate data to examine the role of various factors in urban-rural fertility variation and ensures that our sample is sufficiently large for obtaining robust results.

Hypotheses on the relative contribution of various factors

First we expect fertility levels to significantly vary by settlements, being the highest in small towns and rural areas and the lowest in large cities. We assume to observe differences for all three parity transitions (Thygesen et al. 2005; Kulu et al. 2007). Second, we expect socio-economic characteristics of women to account for some fertility variation across settlements (Hank 2001; de Beer and Deerenberg 2007). However, socio-economic factors may play smaller role in explaining spatial fertility variation as shown in previous studies: the focus of this study is on childbearing of women in union and there are fewer in cities and towns who still study at this stage of life compared to when they were single. Also, fertility levels vary relatively little by education in Finland (and in other Nordic countries) where our data-set comes from (Andersson et al. 2009). Third, we expect selective migrations to play no role in urban-rural fertility differences because we have controlled for possible (confounding) effect of suburbanisation by including suburbs of cities and towns as a part of urban region (cf. Kulu and Boyle 2009). Fourth, we expect housing conditions to explain some urban-rural fertility variation at least. The key question, however, is how much spatial fertility variation is attributed to housing conditions and how much left for remaining factors? We assume that these remaining factors, if any, are related to living environment of couples, both economic and cultural.

Data and definitions

Our data come from the Finnish Longitudinal Fertility Register. This is a database developed by Statistics Finland, which contains linked individual-level information from different administrative registers (see Vikat 2004). The extract we used in the analysis included women's full birth and educational histories. Partnership, residential and housing histories, and annually measured characteristics about women's activity and income were collected for the period from 1987 to 2000. The extract used is a ten-percent random sample stratified by single-year birth cohort, drawn from records of all women who had ever received a personal identification number in Finland and were in the age range 16–49 for some time between 1988 and 2000 (cohorts born between 1938 and 1983). We focused on childbearing among women who were in unions and included in the analysis all co-residential unions that were formed between 1988 and 2000. Foreign-born women (three percent) were excluded from the analysis.

We studied the impact of settlement type on first, second and third birth. We distinguished four types of settlements according to the size of municipality of residence: 1) the capital city of Helsinki with 500,000 and more inhabitants; 2) other cities with a population of 50,000–250,000; 3) towns with 10,000–50,000 inhabitants; 4) small towns and rural areas – municipalities with less than 10,000 inhabitants. We also considered that all cities and many towns extend beyond their administrative borders and defined suburban municipalities to cities and towns (with more than 30,000 inhabitants) as part of the urban regions. We followed a definition developed by Statistics Finland and assigned a municipality to the urban region if at least 10% of its employed population commuted to work in the neighbouring city or town in 2000. Using commuting data to define labour-market regions is standard in migration and urbanisation research, although the threshold used varies across studies (see Champion 2001; Hugo et al. 2003; Kupiszewski et al. 2000).

Table 1 presents the distribution of person-years (exposures) and events (occurrences) across various settlement groups. The former shows how partnered women and their residential durations were distributed across various settlements in the period when they were at risk for first, second or third birth. Thirty four percent of all person-years for first birth were lived in the capital city, 36% in other cities, 20% in towns and 9% in small towns and rural areas. The figures for the second birth were 30%, 37%, 21% and 11%, and for the third birth 27%, 37%, 23% and 13%, accordingly. There were 14,258 first births for 35,391 women, 12,097 second births for 23,154 women and 4,120 third births for 17,246 women in the data. Childless women who formed a union between 1988 and 2000 made up the population at risk for first birth; the data-set for second and third birth also included women who had their first or second conception (which led to a birth) in 1988 or later, but before union formation, and women who had their first or second conception (which led to a birth) before 1988, but formed another union in 1988 or later.

We controlled for a set of demographic and socio-economic variables when examining fertility variation across settlements. Our demographic controls included: union duration, woman's age, the age of the youngest child (if there were any). The socio-economic controls included women's language (Finnish or Swedish), educational enrolment (enrolled or not enrolled), educational level (lower secondary, upper secondary, vocational, lower tertiary or upper tertiary) and annual earnings (none, low, medium, high or very high)[1]. We also controlled for calendar time. In addition, we included in the analysis a variable showing whether a couple had changed the settlement of residence or not to control for the possible effect of selective migrations. For second and third births, we only considered migrations that

[1] We thank Andres Vikat for preparing a command file for calculation of earnings in the Finnish context.

had taken place after the birth of first or second child, correspondingly. Finally, we included in the analysis housing type, distinguishing between detached (and semi-detached) house, terraced house, and apartment. We also included the number of living rooms (i.e. rooms without kitchen and bathroom) to specify the essence of possible housing effect.

Methods and modelling strategy

We used an event-history analysis (Hoem 1987; 1993; Blossfeld and Rohwer 1995), fitting a series of regression models for the hazard of first, second, and third birth. We modelled the time to conception (which subsequently led to a birth) in order to measure the effect of settlement of residence on childbearing decisions as precisely as possible. The basic model can be formalised as follows:

$$\ln \mu_i(t) = y(t) + \sum_{ik} z_k(u_{ik} + t) + \sum_j \alpha_j x_{ij} + \sum_l \beta_l w_{il}(t), \qquad (1)$$

where $\mu_i(t)$ denotes the hazard of the first, second or third conception for individual i and $y(t)$ denotes a piecewise linear spline that captures the baseline log-hazard (union duration for first birth, the age of the youngest child for second and third births). We used a piecewise linear spline specification, instead of the widely used piecewise constant approach, to pick up the baseline log-hazard and the effect of (other) time-varying variables that change continuously. Parameter estimates are thus slopes for linear splines over user-defined time periods. With sufficient nodes (bend points) a piecewise linear-specification can efficiently capture any log-hazard pattern in the data (for further details, see Lillard and Panis 2003). $z_k(u_{ik} + t)$ denotes the spline representation of the effect of a time-varying variable that is a continuous function of t with origin u_{ik} (woman's age, calendar time and union duration for second and third birth). x_{ij} represents the values of a time-constant variable (language) and $w_{il}(t)$ represents a time-varying variable whose values can change only at discrete times (place of residence and all other variables).

In our modeling strategy, we first investigated first, second and third birth risk by settlement type controlling for basic demographic characteristics (union duration, woman's age and the age of the youngest child, if any). We then also controlled for socio-economic characteristics of women to explore how much these explained urban-rural fertility variation. In the third model, we also included migrant status to examine whether selective migrations played any role in spatial fertility variation. Finally, we included in the analysis housing type and size to further explain fertility variation across settlements. The aim of stepwise modeling was to examine the relative contribution of socio-economic characteristics, selective migrations, housing conditions and contextual (or remaining) factors to urban-rural fertility variation.

Parity-specific fertility across settlements

First birth

In the first model, we only controlled for union duration and the woman's age. Couples living in the capital city of Helsinki had the lowest risk of first birth, while couples in rural areas and small towns had the highest risk (Table 2, Figure 1). In the second model, we also controlled for socio-economic characteristics of women. The differences between settlements largely persisted. In the third model, we also included migrant status to control for the effect of selective migrations. Couples who had changed their settlement of residence had a higher risk of first birth than couples who had not moved suggesting that selective migrations were indeed in operation. The patterns did not change, however, because of the small share of selective migrants. This was expected as we had included suburban municipalities as part of urban regions.

Next, we also controlled for housing type. The differences in the levels of first birth diminished considerably and disappeared between rural areas and small towns and between cities and towns. A high risk of first birth in rural areas and small towns was thus largely attributed to the fact that detached / semi-detached and terraced houses are dominant housing type there, while in urban areas in Finland (and other Nordic countries) most people live in apartments. Still, interestingly, women living in the capital city had a significantly lower risk of first birth than those living in other settlements, even after controlling for housing conditions, suggesting that socio-economic factors and housing conditions did not explain all spatial variation in the levels of first birth, and there were other factors, possibly contextual ones. Finally, we also included the size of housing in the analysis. Couples living in larger housing had a higher risk of first birth than those in smaller housing. While this step did not further account for spatial variation in the levels of first birth, the impact of housing type decreased, suggesting that housing size was partly responsible for the housing effect (see Appendix 1).

Second birth

Women living in rural areas and small towns had a significantly higher risk of second birth than those in cities and towns, but the risk of second birth was not lower for women living in Helsinki (Table 3, Figure 3). In the second and third model, we controlled for socio-economic characteristics of women and migrant status. The initial differences between the settlements persisted, suggesting that compositional factors and selective migrations played no role in spatial variation in the risk of second birth. In the fourth model, we additionally controlled for housing type and in the fifth model, also housing size. The differences between urban and between rural areas decreased significantly, but the birth levels still remained slightly higher in rural areas. As for first birth, couples living in larger housing had a higher risk of birth, and housing size explained some housing effect (see Appendix 2).

Third birth

The patterns for third birth were also interesting. Couples living in Helsinki had the lowest risk of third birth, while couples in rural areas and small towns had the highest risk (Table 4, Figure 5). This was similar what we observed for first birth. Next, we controlled for socio-economic characteristics of women and migrant status. Couples who had changed their settlement of residence had a higher risk of birth than couples who had not moved showing that selective migrations were in operation also for third birth. However, the patterns did not change because of the small share of (selective) migrants. In the fourth model, we controlled for housing type. Spatial fertility variation decreased, as it did for first and second birth. Interestingly, however, the levels of third birth remained significantly higher in rural areas and small towns than in urban areas, clearly indicating that other factors, possibly contextual ones were responsible for a high risk of third birth in smaller settlements. Finally, couples living in larger housing had a higher risk of third birth than those in smaller housing; again, housing size explained some housing effect, but not remaining differences in the levels of third birth between urban and rural areas (see Appendix 3).

Summary and discussion

The aim of this study was to investigate the causes of urban-rural fertility variation. Using rich longitudinal register data from Finland we examined the relative contribution of socio-economic characteristics of population, selective migrations, housing conditions and contextual factors to fertility variation between various settlements. Our study showed, first, that fertility levels varied significantly across settlements for all three parity transitions. The levels were the highest in small towns and rural areas and the lowest in the capital city of Helsinki. Second, socio-economic characteristics of women accounted for only a small portion of fertility variation across settlements. Third, selective migrations did not explain any spatial fertility variation: couples who had changed their settlement of residence had higher birth rates, but the share of internal migrants was small. Fourth, housing conditions accounted for a significant portion of fertility variation across settlements. Fifth, we observed a significant fertility variation across settlements after controlling for compositional characteristics, selective migrations and housing conditions suggesting that there were also contextual effects. The first-birth levels were relatively low in the capital city of Helsinki; the second and especially third-birth rates were high in rural areas and small towns.

Why the first-birth levels were low in large cities? It could be argued that omitted individual or couple characteristics were the reason: marital status and partner's education and income, for example. The share of married people was smaller in the capital city and this explained lower first-birth rates there. However, the direction of causality between marriage and childbearing is far from clear, as we discussed earlier. People may simply decide to marry when they wish to have children and marriage is thus a consequence (or a part) of family formation rather than its cause (Baizan et al. 2004). Also, we controlled for marriage in our further analysis, but significant differences in the first-birth rates persisted between the settlements. The inclusion of information on partner's education and income would have not changed the patterns, either. Previous studies on the Nordic countries have shown that in the context of a relatively high educational homogamy and prevalence of dual-earner couples, woman's educational and labour market characteristics are good proxies for the household's labour market performance and income and its association with childbearing (cf. Andersson and Scott 2007). We are thus confident that contextual factors played a role in low fertility in the capital city. But which of them were critical factors?

To begin with economic factors, it could be argued that some couples are unable to afford a child in large cities because of the high costs of raising a child. However, while this may be true in some contexts, this is unlikely the case for Finland and other Nordic countries where generous welfare provisions by the state ensure that couples enjoy sufficient security when raising a child. We may continue by arguing that higher opportunities costs are what account for lower first-birth rates in large cities. Again, it is unlikely that this is a critical factor in the Nordic context. Generous maternity leave, availability of high-quality childcare and flexible work arrangement for parents (in public sector) should minimise the opportunities costs for parents, particularly if they (only) raise one child. The difficulties of reconciling work with childcare in a large city because of time and space constraints (potentially long journeys from and to home) are also unlikely to lead a couple to a decision of not having any children (cf. Fagnani 1991).

Significantly lower first-birth levels in large cities may thus be related to cultural-normative factors, for example, to voluntary childlessness. Recent studies reveal a spread of voluntary childlessness in European countries (Goldstein et al. 2003), and it could be argued that large cities are the places where such behaviour emerged and spread first. The large city environment is a source of heterogeneity in behavioural patterns and it supports the existence of various sub-cultures including singles and couples who have decided not to have any children; in smaller places, in turn, union formation (marriage) and childbearing are still expected to be closely connected (Heaton et al. 1989; Snyder 2006). It is also possible that people with different family plans move to different environments in some stage of their lives (e.g. those who plan to remain childless leave rural areas for cities after leaving the high school), but research in other European countries has found no support to this argument (Kulu 2005; 2006).

We have undermined the role of economic opportunities and constraints in explaining low first-birth levels in large cities and emphasised the importance of cultural-normative factors instead. This view, however, is challenged by the fact that housing conditions explained a significant amount of spatial variation in the first-birth levels. Although the study of the exact nature of the 'housing effect' is beyond the scope of this paper, the results suggest that limited availability or, more precisely, affordability of 'proper' housing is a factor that explains lower first-birth rates in urban areas, particularly in large cities. Access to 'proper' housing is a pre-condition for family formation in most industrialised societies. This is a requirement, which is more difficult to fulfil in large cities compared to towns and rural areas; further, the requirements for housing conditions for family formation may also be higher in the city environment.

It seems reasonable to assume that economic opportunities and constraints play an important role in explaining spatial variation in higher order childbearing. Raising the second and especially the third child is costly in cities, even in the context of Nordic welfare state. Further, despite generous policies, which aim at reconciliation of parenthood with employment, large family limits women's career opportunities, certainly in the competitive city environment. It also takes much effort and time to organise everyday activities of a large family in the city context. If this reasoning was true, we should expect the second and third-birth levels to be particularly low in large cities where the constraints are the largest. However, we observed the main fertility differences between urban areas, including both large cities and medium-sized towns, and between rural areas. Further, while housing explained a significant portion of spatial variation in the first-birth rates, it did account for (slightly) less variation in the second and third-birth levels; one would have expected opposite had opportunities and constraints been critical factors.

What then (or what else) explains high third-birth levels in rural areas and small towns? Daily support is particularly important for parents with large families and grandparents are primary source in this respect. It is thus possible that higher-third birth rates in rural areas and small towns can be attributed to a better availability of grandparental support. Interestingly, however, recent studies in the Nordic context have shown that there is not much difference between the urban and rural areas – grandparents are (almost) equally available (or not available) in the cities and rural areas (cf. Malmberg and Pettersson 2007). It can be argued that inter-generational transmission of fertility explains high third-birth levels in rural areas and small towns: many rural and small town residents come from the families with three children. Again, previous studies based on survey data have shown that significant spatial variation in the third-birth levels remains after controlling for the number of siblings (Kulu 2005; 2006). We also controlled for the effect of unmeasured characteristics of women in our further analysis, but this did not change the results (see Model 6 in Appendix 1 to 3). It is thus likely that cultural-normative (contextual) factors account for particularly high third-birth levels in rural areas and small towns as compared to the levels in towns and cities. Rural and small town population has been and remains a subculture with a value orientation towards large families.

This study showed a significant fertility variation across settlements in an industrialised country. Its novelty lies in a decomposition of urban-rural fertility variation, which revealed that a substantial portion of spatial fertility variation was attributed to housing conditions and contextual factors. The role of contextual factors in explaining urban-rural fertility variation needs further investigation. A conventional way to examine contextual effects on fertility behaviour is to apply multilevel models on data on individuals and their regions of residence (Hank 2002). However, while this is a proper way to explore spatial fertility variation in its full extent and nuances, it may not be the best way to examine urban-rural fertility variation, which is of persistent nature and difficult to explain by using conventional contextual characteristics. Another and perhaps more fruitful way to proceed is to interview a sample of (similar) couples living in various settlements to better understand the socio-spatial context of their childbearing decisions. The aim is to gain a better understanding of how social context shapes a couple's childbearing behaviour (cf. Becker 1991; McDonald 2000; Lesthaeghe and Neels 2002; Neyer and Andersson 2008; Thornton and Philipov 2009). This study showed that residential context matters.

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

	Person-years		Births	
	Number	Percent	Number	Percent
First birth				
Capital city	33716.34	34	4494	32
Other cities	35395.34	36	5228	37
Towns	19849.82	20	2998	21
Rural areas and small towns	8980.05	9	1538	11
Total	97941.56	100	14258	100
Second birth				
Capital city	15324.76	30	3446	28
Other cities	18705.52	37	4447	37
Towns	10706.93	21	2648	22
Rural areas and small towns	5561.81	11	1556	13
Total	50299.01	100	12097	100
Third birth				
Capital city	13760.01	27	957	23
Other cities	18694.41	37	1476	36
Towns	11451.49	23	970	24
Rural areas and small towns	6779.79	13	717	17
Total	50685.70	100	4120	100

Source: Calculations based on Finnish Longitudinal Fertility Register, 1988–2000.

Table 2: Relative Risks of Conception Leading to First Birth.

Place of residence	Model 1		Model 2		Model 3		Model 4		Model 5	
Capital city	0.88	***	0.86	***	0.86	***	0.91	***	0.92	***
Other cities	1		1		1		1		1	
Towns	1.04	*	1.02		1.02		0.98		0.98	
Rural areas and small towns	1.18	***	1.14	***	1.14	***	0.99		1.00	

Source: Calculations based on Finnish Longitudinal Fertility Register, 1988–2000.
Significance: '*'=10%; '**'=5%; '***'=1%.
Model 1: controlled for union duration and the woman's age.
Model 2: additionally controlled for language, educational level and enrolment, earnings and calendar time.
Model 3: additionally controlled for migration.
Model 4: additionally controlled for housing type.
Model 5: additionally controlled for the number of rooms.

Table 3: Relative Risks of Conception Leading to Second Birth.

Place of residence	Model 1		Model 2		Model 3		Model 4		Model 5	
Capital city	0.98		0.98		0.98		1.02		1.01	
Other cities	1		1		1		1		1	
Towns	1.02		1.02		1.02		0.99		0.99	
Rural areas and small towns	1.15	***	1.15	***	1.14	***	1.04	*	1.05	**

Source: Calculations based on Finnish Longitudinal Fertility Register, 1988–2000.
Significance: '*'=10%; '**'=5%; '***'=1%.
Model 1: controlled for the age of the first child, union duration and the woman's age.
Model 2: additionally controlled for language, educational level and enrolment, earnings and calendar time.
Model 3: additionally controlled for migration.
Model 4: additionally controlled for housing type.
Model 5: additionally controlled for the number of rooms.

Table 4: Relative Risks of Conception Leading to Third Birth.

Place of residence	Model 1		Model 2		Model 3		Model 4		Model 5	
Capital city	0.92	**	0.93	*	0.93	*	0.97		0.97	
Other cities	1		1		1		1		1	
Towns	1.05		1.06		1.05		1.02		1.02	
Rural areas and small towns	1.22	***	1.22	***	1.21	***	1.13	**	1.13	***

Source: Calculations based on Finnish Longitudinal Fertility Register, 1988–2000.
Significance: '*'=10%; '**'=5%; '***'=1%.
Model 1: controlled for the age of the second child, union duration and the woman's age.
Model 2: additionally controlled for language, educational level and enrolment, earnings and calendar time.
Model 3: additionally controlled for migration.
Model 4: additionally controlled for housing type.
Model 5: additionally controlled for the number of rooms.

Figure 1: Relative Risks of Conception Leading to First Birth: Model 1.

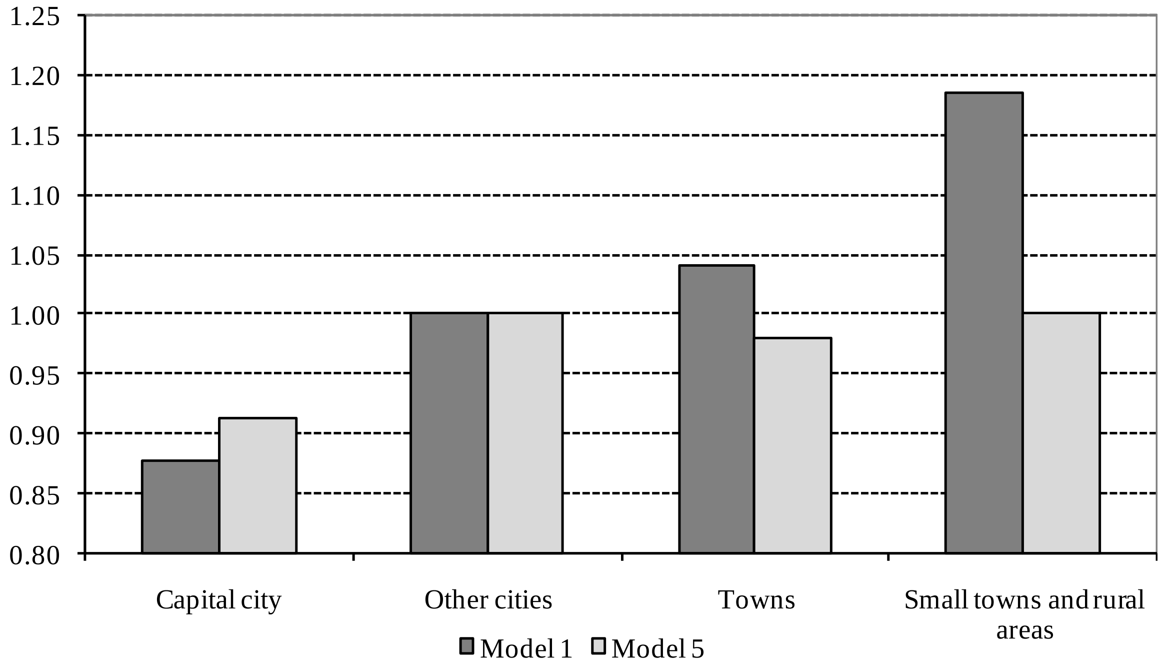

Figure 2: Relative Risks of Conception Leading to First Birth: Model 1 and 5.

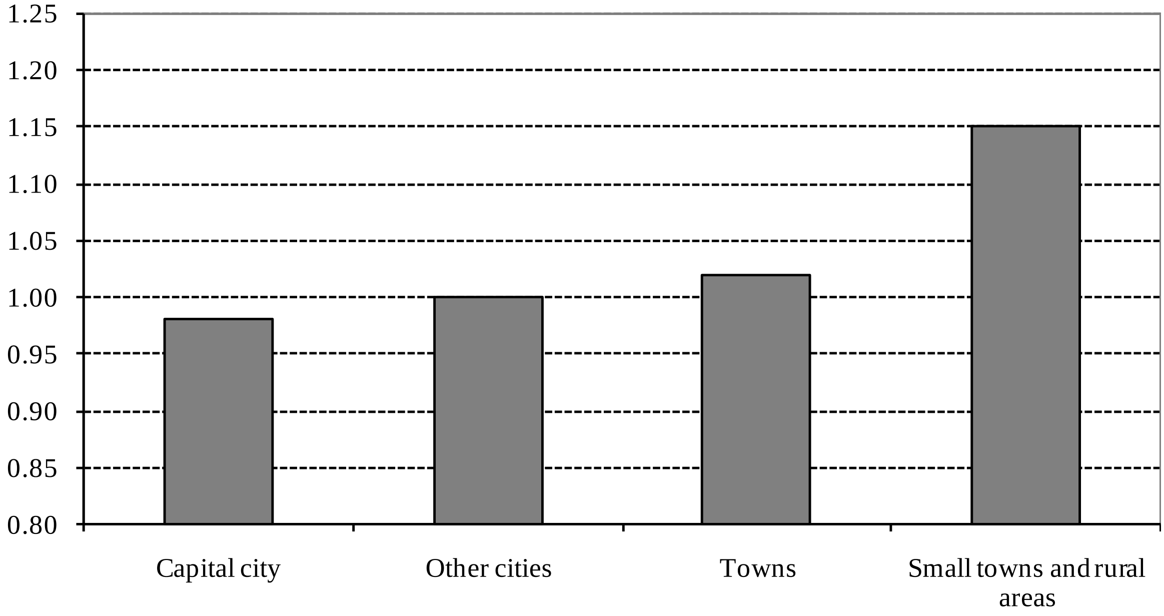

Figure 3: Relative Risks of Conception Leading to Second Birth: Model 1.

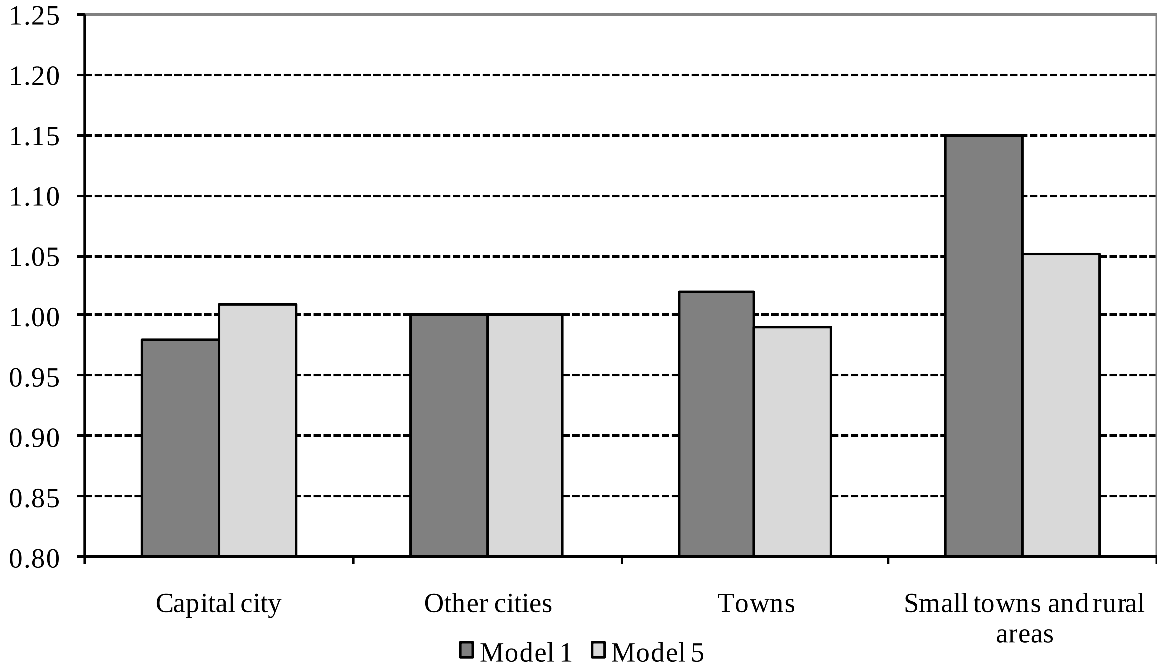

Figure 4: Relative Risks of Conception Leading to Second Birth: Model 1 and 5.

Figure 5: Relative Risks of Conception Leading to Third Birth: Model 1.

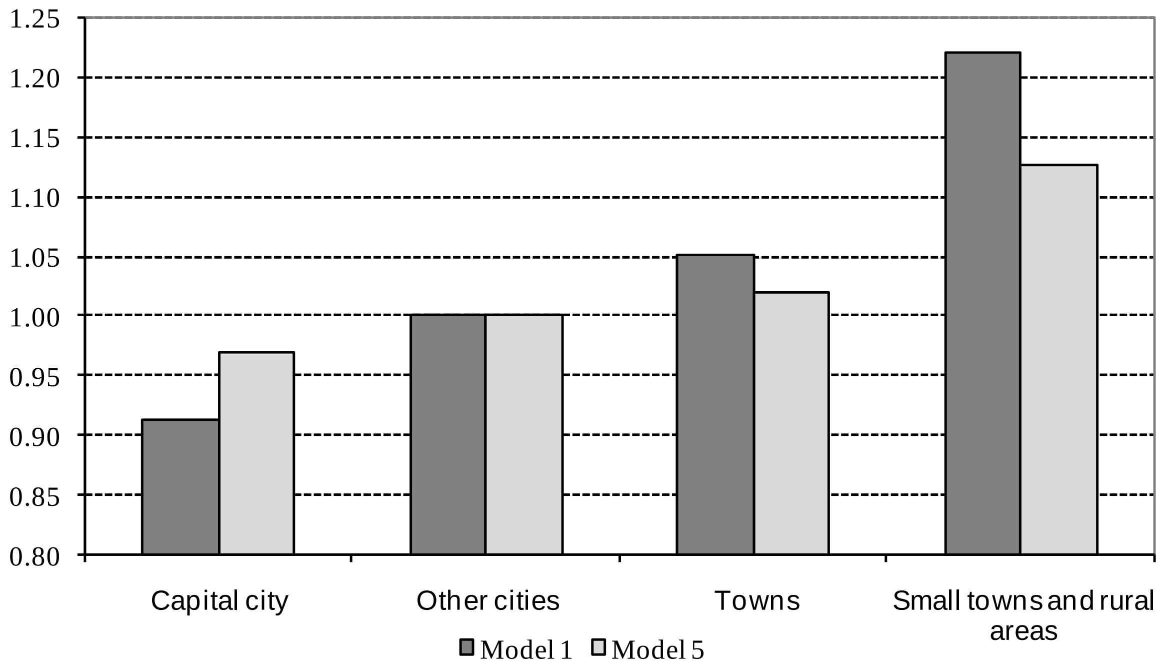

Figure 6: Relative Risks of Conception Leading to Third Birth: Model 1 and 5.

Appendix 1: Log-risks of conception leading to first birth.

Variable	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Place of residence												
Capital city	-0.126	***	-0.151	***	-0.150	***	-0.099	***	-0.088	***	-0.100	***
Other cities	0		0		0		0		0		0	
Towns	0.042	*	0.023		0.021		-0.020		-0.023		-0.017	
Rural areas and small towns	0.167	***	0.133	***	0.127	***	-0.009		0.000		0.009	
Demographic variables												
Union duration (baseline)												
Constant	-2.507	***	-0.553	**	-0.541	**	-0.510	*	-0.178		-0.449	
0-1 years (slope)	-0.165	***	-0.172	***	-0.176	***	-0.183	***	-0.200	***	-0.171	***
1-3 years (slope)	0.069	***	0.079	***	0.078	***	0.067	***	0.060	***	0.087	***
3-5 years (slope)	-0.005		0.002		0.002		-0.007		-0.010		0.020	
5+ years (slope)	-0.137	***	-0.125	***	-0.125	***	-0.129	***	-0.129	***	-0.109	***
Age												
-24 years (slope)	0.086	***	0.050	***	0.050	***	0.047	***	0.044	***	0.048	***
25-29 years (slope)	0.072	***	0.045	***	0.045	***	0.040	***	0.039	***	0.050	***
30-34 years (slope)	-0.072	***	-0.069	***	-0.068	***	-0.070	***	-0.070	***	-0.072	***
35+ years (slope)	-0.270	***	-0.274	***	-0.274	***	-0.273	***	-0.274	***	-0.288	***
Socio-economic variables												
Year												
1988-2000 (slope)			-0.017	***	-0.017	***	-0.018	***	-0.021	***	-0.019	***
Language												
Finnish			0		0		0		0		0	
Swedish			0.103	**	0.104	**	0.091	**	0.083	**	0.089	**
Educational enrolment												
Not enrolled			0		0		0		0		0	
Enrolled			-0.568	***	-0.568	***	-0.548	***	-0.550	***	-0.566	***
Educational level												
Lower secondary			0.110	***	0.110	***	0.112	***	0.115	***	0.142	***
Upper secondary			0		0		0		0		0	
Vocational			0.093	***	0.093	***	0.088	***	0.076	***	0.077	***
Lower tertiary			0.284	***	0.281	***	0.291	***	0.271	***	0.274	***
Upper tertiary			0.253	***	0.250	***	0.265	***	0.234	***	0.234	***
Earnings												
None			-0.394	***	-0.395	***	-0.387	***	-0.375	***	-0.373	***
Low			-0.021		-0.022		-0.014		-0.010		-0.003	
Medium			0		0		0		0		0	
High			0.066	***	0.067	***	0.056	**	0.037		0.034	
Very high			0.106		0.106		0.066		0.014		0.022	
Migrations												
No moves					0		0		0		0	
One or two moves					0.090	**	0.098	**	0.091	**	0.082	**
Housing conditions												
Housing type												
Detached house							0.379	***	0.247	***	0.267	***
Terraced house							0.256	***	0.201	***	0.214	***
Apartment							0		0		0	

Variable	Model 1	Model 2	Model 3	Model 4	Model 5		Model 6	
Number of rooms								
One room					-0.348	***	-0.360	***
Two rooms					0		0	
Three rooms					0.192	***	0.203	***
Four rooms					0.171	***	0.192	***
Five or more rooms					0.243	***	0.259	***
Missing					0.176	*	0.166	
Log-likelihood	-91239.4	-90803.5	-90801.0	-90640.9	-90495.2		-187125	

Source: Calculations based on Finnish Longitudinal Fertility Register, 1988–2000.
Significance: '*'=10%; '**'=5%; '***'=1%.
Notes: For linear splines we present slope estimates which show how the log-hazard increases or decreases over a certain time period; For Model 6 we present a likelihood of simultaneous-equations model for all three births.

Appendix 2: Log-risks of conception leading to second birth.

Variable	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Place of residence												
Capital city	-0.020		-0.020		-0.019		0.018		0.014		0.008	
Other cities	0		0		0		0		0		0	
Towns	0.024		0.022		0.019		-0.014		-0.014		-0.015	
Rural areas and small towns	0.143	***	0.137	***	0.134	***	0.044	*	0.052	**	0.070	**
Demographic variables												
Time since first birth (baseline)												
Constant	-3.129	***	-1.966	***	-1.942	***	-1.750	***	-1.617	***	-1.863	***
0-1 years (slope)	2.493	***	2.561	***	2.559	***	2.550	***	2.537	***	2.626	***
1-3 years (slope)	-0.160	***	-0.110	***	-0.112	***	-0.111	***	-0.113	***	-0.025	
3-5 years (slope)	-0.298	***	-0.298	***	-0.299	***	-0.294	***	-0.294	***	-0.293	***
5+ years (slope)	-0.089	***	-0.081	***	-0.081	***	-0.081	***	-0.080	***	-0.087	***
Union duration (baseline)												
0-1 years (slope)	-0.107	*	-0.106	*	-0.111	*	-0.115	*	-0.115	*	-0.042	
1-3 years (slope)	-0.024		-0.027		-0.028		-0.034	*	-0.034	*	-0.077	***
3-5 years (slope)	-0.014		-0.020		-0.020		-0.024		-0.023		-0.006	
5+ years (slope)	-0.049	***	-0.048	***	-0.048	***	-0.051	***	-0.051	***	-0.031	**
Age												
-24 years (slope)	0.029	***	-0.008		-0.008		-0.013		-0.014		-0.022	**
25-29 years (slope)	-0.004		-0.024	***	-0.024	***	-0.027	***	-0.029	***	-0.024	***
30-34 years (slope)	-0.054	***	-0.061	***	-0.061	***	-0.061	***	-0.061	***	-0.062	***
35+ years (slope)	-0.218	***	-0.219	***	-0.219	***	-0.221	***	-0.222	***	-0.235	***
Socio-economic variables												
Year												
1988-2000 (slope)			-0.009	***	-0.010	***	-0.012	***	-0.014	***	-0.013	***
Language												
Finnish			0		0		0		0		0	
Swedish			-0.029		-0.029		-0.047		-0.047		-0.052	
Educational enrolment												
Not enrolled			0		0		0		0		0	
Enrolled			-0.358	***	-0.361	***	-0.343	***	-0.347	***	-0.374	***
Educational level												
Lower secondary			-0.218	***	-0.217	***	-0.208	***	-0.203	***	-0.202	***
Upper secondary			0		0		0		0		0	
Vocational			0.152	***	0.151	***	0.149	***	0.142	***	0.152	***
Lower tertiary			0.247	***	0.245	***	0.243	***	0.232	***	0.240	***
Upper tertiary			0.237	***	0.232	***	0.241	***	0.227	***	0.227	***
Earnings												
None			-0.338	***	-0.339	***	-0.323	***	-0.316	***	-0.326	***
Low			0.041	*	0.040	*	0.049	**	0.052	**	0.058	**
Medium			0		0		0		0		0	
High			0.029		0.031		0.021		0.013		0.008	
Very high			0.175	**	0.174	**	0.131		0.108		0.126	
Migrations												
No moves					0		0		0		0	
One or two moves					0.082	**	0.098	**	0.093	**	0.104	**

Variable	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Housing conditions												
Housing type												
Detached house							0.275	***	0.216		0.238	***
Terraced house							0.137	***	0.121		0.129	***
Apartment									0		0	
Number of rooms												
One room									-0.091	*	-0.102	*
Two rooms									0		0	
Three rooms									0.101	***	0.115	***
Four rooms									0.136	***	0.154	***
Five or more rooms									0.188	***	0.213	***
Missing									-0.056		-0.039	
Log-likelihood			-68782.8		-68780.6		-68706.7		-68682.7		-187125	

Source: Calculations based on Finnish Longitudinal Fertility Register, 1988–2000.
Significance: '*'=10%; '**'=5%; '***'=1%.
Notes: For linear splines we present slope estimates which show how the log-hazard increases or decreases over a certain time period; For Model 6 we present a likelihood of simultaneous-equations model for all three births.

Appendix 3: Log-risks of conception leading to third birth.

Variable	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Place of residence												
Capital city	-0.086	**	-0.077	*	-0.072	*	-0.031		-0.035		-0.045	
Other cities	0		0		0		0		0		0	
Towns	0.047		0.054		0.049		0.022		0.018		0.022	
Rural areas and small towns	0.201	***	0.199	***	0.190	***	0.119	**	0.121	**	0.148	***
Demographic variables												
Time since second birth (baseline)												
Constant	-2.499	***	-2.678	***	-2.621	***	-2.447	***	-2.407	***	-2.698	***
0-1 years (slope)	1.931	***	1.981	***	1.973	***	1.962	***	1.958	***	1.998	***
1-3 years (slope)	-0.083	***	-0.044		-0.050		-0.053	*	-0.053	*	-0.018	
3-5 years (slope)	0.008		0.004		0.003		0.003		0.002		0.016	
5+ years (slope)	-0.066	***	-0.059	***	-0.059	***	-0.057	***	-0.057	***	-0.052	***
Union duration (baseline)												
0-1 years (slope)	-0.247	**	-0.248	**	-0.261	**	-0.275	***	-0.276	***	-0.207	**
1-3 years (slope)	-0.068	*	-0.075	*	-0.078	**	-0.084	**	-0.084	**	-0.126	***
3-5 years (slope)	-0.169	***	-0.178	***	-0.177	***	-0.180	***	-0.180	***	-0.205	***
5+ years (slope)	-0.060	***	-0.062	***	-0.061	***	-0.063	***	-0.063	***	-0.056	***
Age												
-24 years (slope)	-0.058	**	-0.068	**	-0.068	**	-0.074	***	-0.073	***	-0.067	**
25-29 years (slope)	-0.045	***	-0.059	***	-0.058	***	-0.060	***	-0.062	***	-0.056	***
30-34 years (slope)	-0.036	***	-0.042	***	-0.041	***	-0.042	***	-0.043	***	-0.040	***
35+ years (slope)	-0.248	***	-0.252	***	-0.251	***	-0.252	***	-0.252	***	-0.261	***
Socio-economic variables												
Year												
1988-2000 (slope)			0.002		0.002		0.000		0.000		-0.001	
Language												
Finnish			0		0		0		0		0	
Swedish			-0.106		-0.102		-0.122	*	-0.126	*	-0.115	
Educational enrolment												
Not enrolled			0		0		0		0		0	
Enrolled			-0.289	***	-0.298	***	-0.273	***	-0.275	***	-0.282	***
Educational level												
Lower secondary			-0.123	***	-0.123	***	-0.107	**	-0.099	**	-0.075	
Upper secondary			0		0		0		0		0	
Vocational			0.053		0.052		0.047		0.040		0.034	
Lower tertiary			0.310	***	0.305	***	0.299	***	0.292	***	0.306	***
Upper tertiary			0.145	**	0.136	**	0.137	**	0.124	*	0.124	*
Earnings												
None			-0.159	***	-0.163	***	-0.148	**	-0.141	**	-0.140	**
Low			0.149	***	0.145	***	0.151	***	0.155	***	0.156	***
Medium			0		0		0		0		0	
High			-0.008		-0.010		-0.018		-0.026		-0.033	
Very high			0.258	**	0.255	**	0.230	*	0.201		0.214	
Migrations												
No moves					0		0		0		0	
One or two moves					0.223	***	0.238	***	0.236	***	0.243	***

Variable	Model 1	Model 2	Model 3	Model 4		Model 5		Model 6	
Housing conditions									
Housing type									
Detached house				0.239	***	0.183		0.200	***
Terraced house				0.023		0.013		0.017	
Apartment				0		0		0	
Number of rooms									
One room						-0.119		-0.115	
Two rooms						0		0	
Three rooms						-0.011		-0.002	
Four rooms						0.060		0.069	
Five or more rooms						0.155	***	0.168	***
Missing						-0.117		-0.115	
Standard deviation of residual								0.454	***
Log-likelihood	-28083.9	-28044.3	-28038.3	-28014.9		-28008.0		-187125	

Source: Calculations based on Finnish Longitudinal Fertility Register, 1988–2000.
Significance: '*'=10%; '**'=5%; '***'=1%.
Notes: For linear splines we present slope estimates which show how the log-hazard increases or decreases over a certain time period; For Model 6 we present a likelihood of simultaneous-equations model for all three births.