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Jan Saarela and Ben Wilson

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Forced migration and the childbearing of women and men: A disruption of the tempo and quantum of fertility?

Jan Saarela [CO], 1 and Ben Wilson [CO], 2, 3 *

[CO] - Both authors claim first-authorship and equal co-authorship of this work

1: Demography Unit, Åbo Akademi University, Vaasa, Finland
2: Department of Sociology, University of Stockholm, Stockholm, Sweden
3: Department of Methodology, London School of Economics, Houghton Street, London, UK

* Corresponding author: ben.wilson@sociology.su.se

Abstract

It is well known that migrant fertility is strongly associated with age at migration. However the majority of prior research has focussed on foreign-born women who migrated for reasons relating to education, employment, or family reunification. Less is known about the fertility of forced migrants, whose mobility is more likely to be associated with traumatic circumstances. This trauma, and the lack of any opportunity for return migration, may have significant long-run impacts on the quantum and tempo of childbearing, which can both be expected to vary by age at migration. Here, we study a unique example of forced displacement in which the entire population of Finnish Karelia was forced to move to other areas of Finland following the Soviet annexation in the 1940s. The context is unique because of its size and scale, because we have data on almost the whole population of both men and women who moved, and because of the similarity between origin and destination. This similarity means that we are able to investigate the disruptive impact of forced migration, net of other factors that impact migrant fertility such as adaptation. Migrant selectivity also plays a more minor role because of the exogenous nature of the event and the fact that the entire origin population was forced to move. Our results show that, for all ages at migration from 1 to 20, female forced migrants had lower levels of completed fertility than similar women from the rest of Finland, suggesting a permanent and pervasive disruptive effect. Women born in 1940, during the initial forced migration, showed no difference from other Finns. For them, disruption may be counterbalanced by a fertility-increasing effect, as observed elsewhere for people born during a humanitarian crisis. There is less evidence of disruption for men and no evidence for those who migrated around the onset of puberty, suggesting a highly gendered impact of forced migration on fertility. Evidence of disruption persists after controlling for social and spatial mobility, which suggests that there is no major trade-off between reproduction and social progress. We recommend that future research examines the generalisability of our results.

Keywords: *Gender, Fertility, Migration, Forced migration, Refugees, Disruption, Finland, Karelia*

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Introduction

The number of refugees and internally displaced people across the globe has continued to increase over the last few decades (Castles et al. 2013; Livi Bacci 2012; Massey 2005). Presently, we live in a world where more than 70 million persons have been forced to move from their homes, the majority of whom remain in their country of origin (UNHCR 2019). Forced displacement has been shown to have a number of consequences (Fiddian-Qasmiyeh et al. 2014), not only in the short run, for example with respect to humanitarian needs (e.g. Busetta et al. 2019; UNHCR 2013; UNICEF 2014), but also over the longer run, for example with respect to health and psychological wellbeing (e.g. Cetorelli et al. 2017; Crepet et al. 2017; Sangalang and Vang 2017). This literature shows that forced migrants are at serious risk of experiencing disadvantage, and that this remains the case many years after their initial displacement.

It is important to understand the consequences of forced migration, not least because it enables governments, international agencies and non-governmental organisations to manage efforts to safeguard lives and protect social welfare (Black 1994; Fiddian-Qasmiyeh et al. 2014). Moreover, knowledge about the long-run effects of forced migration is imperative for predicting the ways that people's lives are likely to change beyond their immediate humanitarian needs (Ager and Strang 2008; Anders et al. 2018; Bansak et al. 2018; Bevelander and Pendakur 2014; Strang and Ager 2010). Despite a considerable number of studies examining the longer-run impacts of forced migration, the majority of research has focussed on either health (Hermans et al. 2017; Mendola and Busetta 2018; Saarela and Elo 2016; Ziersch and Due 2018), mortality (Bauer et al. 2019; Haukka et al. 2017; Saarela and Elo 2016; Saarela and Finnäs 2009) or labour market outcomes (Bevelander 1999; Hainmueller et al. 2016; Marbach et al. 2018). By contrast, there have been few studies of forced migrants' family dynamics over the long run, including outcomes relating to fertility. This is an important gap because the transition to parenthood is well known to impact life-course trajectories. Becoming a parent at an early age, for example, is detrimental for education and labour market outcomes (Goisis and Sigle-Rushton 2014; Hobcraft and Kiernan 2001; Kahn et al. 2014). Additionally, there is an increasing amount of evidence that early childbearing has a more negative impact for women than men (Cohen et al. 2011; Dribe and Stanfors 2009; Nisén et al. 2018), with recent research showing that this is also the case for immigrants and their descendants, including refugees (Wilson et al. 2019).

There is a long-standing debate about the extent to which migration has an impact upon fertility (Milewski 2010). One of the most common findings has been that the average number of children born to migrants is elevated immediately after arrival in a new destination (e.g. Andersson 2004; Mussino and Strozza 2012; Robards and Berrington 2016; Toulemon 2006). Several explanations have been proposed. The selection hypothesis argues that migrants' fertility will be determined by the fact that they are selectively different from non-migrants, particularly in their childbearing prior to migration (Goldstein and Goldstein 1982; Harbison and Weishaar 1981; Hervitz 1985; Kahn 1988). For example, people who have children may be less likely to migrate (or the childless may be more likely to migrate), which would imply a reverse causal link between migration and fertility (Toulemon 2006). Another explanation, which may or may not occur alongside reverse causality, is that childbearing is disrupted by migration (Goldstein and Goldstein 1982; Hervitz 1985; Stephen and Bean 1992). This disruption may be caused by the psychological stress of the migration (Goldstein and Goldstein 1982), the separation of partners (Menken 1979), or the anticipation of migration (Ford 1990), so that people decide to postpone childbirth or partnership formation (Milewski 2010). Delay in partnership formation is one of the strongest determinants of childbirth (Balbo et al. 2012). This has led some to propose a hypothesis of 'interrelation of events', which typically refers to partnership (family) formation as a key mechanism that determines migrant fertility (Milewski 2007; Singley and Landale 1998). A further explanation is adaptation (sometimes called straight-line assimilation), which predicts that migrant fertility will become increasingly similar to the fertility of the native-born population with increasing duration of residence (Farber and Lee 1984; Harbison and Weishaar 1981).

Researchers often claim to have found evidence of adaptation, selection and disruption in prior studies of non-refugee migrants (Milewski 2010). However, these hypotheses are hard to disentangle empirically. For example, changes in fertility after arrival, e.g. elevated birth rates, may be due to either adaptation, selection, or disruption, or a combination of any of these (Hoem 2013). It has proved hard to falsify these hypotheses, largely because data and research designs are too limited to discount competing explanations (Wilson and Sigle-Rushton 2014).

In order to move beyond this impasse, it is important to understand the role of age at migration, not only as a key determinant of fertility, but also as a means of generating new insights about theories of migrant fertility (Adserà et al. 2012; Adserà and Ferrer 2014; Mussino et al. 2018). By focussing on age at arrival for children who migrate prior to reaching childbearing age, one can minimise the likelihood that selection and reverse causality will impact fertility. Evidence for Canada, England and Wales, France, and Sweden suggests that child migrants have more similar levels of fertility to the destination or native-born average if they arrive as infants, as opposed to if they arrive as teenagers (Adserà et al. 2012; Mussino et al. 2018). However, there is little evidence about the link between the timing of forced migration and fertility. Based on studies of conflict and fertility (Hill 2004), it can be predicted that the timing of forced migration is more likely to have a short-run impact on the timing of births, rather than a long-run impact on completed fertility. However, despite a considerable literature on fertility in humanitarian crises, there are only a few studies on forced migration and fertility (Agadjanian 2018; Avogo and Agadjanian 2008; Lynch et al. 2019; Randall 2005; Saarela and Skirbekk 2018; Verwimp and Van Bavel 2005; Williams et al. 2013), and none appear to have focussed on the link between age at migration and fertility, or the differences between short-run and long-run effects.

Several theories can be drawn upon in order to predict how the timing of forced migration plays a role in determining childbearing. It is not only the case that increased levels of trauma may have a scarring effect on the desire to form a family (Agadjanian 2018; Rumbaut and Weeks 1986), but this scarring may also depend upon the age at which trauma is first experienced, or is manifested, in the form of migration. This childhood trauma hypothesis has been theorised in a number of studies that focus on outcomes other than fertility, for example studies of the long-run health effects of famines, and other natural disasters, that occur during childhood (e.g. Doblhammer et al. 2013; Qi 2017). At the same time, age at forced migration may determine the strength of exposure to mechanisms that can interrupt fertility, such as economic hardship, housing shortages, and separation from partners (Randall 2005).

In this study, we undertake a comprehensive examination of the link between age at forced migration and fertility. Our study context provides an excellent scope for disentangling migrant fertility hypotheses. We focus on an example of displacement in which the entire population of Finnish Karelia were forced to move to other areas of Finland following Soviet annexation in the 1940s. This context is unique because of its size and scale and because of the similarity between origin and destination, meaning that we can investigate the disruptive impact of forced migration, largely in absence of other factors that impact the fertility of migrants. In particular, adaptation is likely to play a negligible role due to the similarity between origin and destination, and selection into migration plays a smaller role than in other contexts because of the exogenous nature of the move and the fact that the entire origin population was forced to migrate.

By comparison with previous research on the same context (Lynch et al. 2019; Saarela and Skirbekk 2018), our study has the advantage of much greater coverage, which brings several benefits. First, our data cover the whole population of both men and women who moved and were still resident in Finland at the end of 1970. Consequently, we can study differences between men and women in the long-run impact of the timing of forced migration, which is usually very difficult because most forced migrants are either men or couples. Our data also cover entire childbearing schedules, which allow us to study birth timing and numbers of children born. In recent years, debates about migrant fertility have been complicated by the realisation that conclusions depend upon the way that fertility is measured (Parrado 2011; Sobotka and Lutz 2011; Toulemon 2004). Fertility is a social process that can be measured in different ways, encompassing both tempo – the timing of births – and quantum – the number of births. It is rare that studies of migrant fertility consider both tempo and quantum, let alone the interrelationships between them (Wilson 2019). In this respect, the data allow us to go beyond previous studies. The data also enable us to control for a range of socio-economic characteristics and to link parents by place of birth, which enables insights about the role of assortative mating.

Background: Explaining migrant fertility

The literature on migrant fertility can be summarised in different ways, but two of the key distinctions between studies are: (1) how they measure fertility, and (2) which groups of migrants they focus on. In this paper, we measure fertility in multiple ways (both quantum and tempo), which has several advantages (that we discuss below), including to demonstrate whether differential fertility persists over the childbearing life course. With respect to migrant groups, we focus on migrants from the first generation (G1) who moved during early adulthood, and those who moved during childhood (members of the '1.5 generation': G1.5). To create a theoretical framework, we therefore draw upon research that has analysed these two generational groups, with a particular focus on studies of fertility and age at migration. As already noted, we are not aware of any prior studies that examine the link between fertility and age at migration for forced migrants. In the context of the forced displacement studied here, both G1 and G1.5 are internal migrants according to contemporary definitions, but as with almost all of the literature on migrant fertility, theories and hypotheses that are used to study international migration can be similarly applied and tested with respect to internal migrants, and vice versa (Kulu 2006; Milewski 2010; Zarate and Zarate 1975).

Previous research has shown that there is typically a negative association between age at migration and fertility prior to arrival for women who migrate as adults (Tønnessen and Wilson 2019; Toulemon 2004; Toulemon and Mazuy 2004; Wilson 2013). After migration, the fertility of women also varies by age at arrival (e.g. Toulemon 2006; Waller et al. 2014), and this variation is different for men (Wolf 2016). Moreover, there is not only evidence of tempo delays for migrants who arrive at older ages, but also evidence of lower levels of completed fertility, i.e. quantum at the end of childbearing (Tønnessen and Wilson 2019; Wilson 2013). The most common explanation for this is that adults who migrate experience a disruption of their childbearing life course (Hervitz 1985; Milewski 2010). There is evidence of elevated levels of fertility, such as higher fertility rates or birth 'intensities', for some female adult migrants immediately after arrival, as compared with prior to arrival, or for longer durations of residence (Andersson 2004; Lindstrom and Giorguli Saucedo 2007; Milewski 2010; Robards and Berrington 2016; Toulemon 2006). This elevation is often interpreted as evidence of disruption, or at least as evidence of 'catch-up behaviour' in response to the interruption and/or the postponement of childbearing (Milewski 2010).

That said, there is some debate over the extent to which much of this evidence can be interpreted as disruption. In particular, it is hard to interpret any analysis of migrant fertility that only compares the childbearing of migrants before and after migration, including with reference to the native-born population (Hoem 2013; Hoem and Nedoluzhko 2016). It follows that the impact of disruption requires researchers to estimate a hypothetical counterfactual, which represents the fertility of migrants in absence of migration. Disruption can be estimated as the difference between this counterfactual and the actual childbearing of migrants, but since the counterfactual can never be observed at the individual level (Holland 1986), it must be estimated using a proxy. One way to estimate the counterfactual for any given migrant would be to compare her or his fertility with that of a non-migrant who remains in the origin and has a similar background and similar characteristics. When this approach has been used, for example for immigrants from Puerto Rico to the USA, it has failed to find evidence of disruption (Singley and Landale 1998), but comparisons with origin remain rare, most likely due to the paucity of comparable data. An alternative is compare with a group who are likely to exhibit the same fertility as migrants if they had not migrated. Here, we argue that a suitable counterfactual for Finnish forced migrants is those who were also born in Finland but who did not experience any displacement. The appropriateness of any counterfactual is determined by the extent that it is affected by selection, but in this case our comparison is relatively unaffected by selection because the migration event is largely exogenous with respect to childbearing, because of the similarities between origin and destination, and because the whole population was displaced.

There are several reasons why the disruption of childbearing might be expected to occur as a result of migration. Some researchers have suggested that migrants delay their childbearing in anticipation of migration (e.g. Andersson 2004; Bledsoe et al. 2007; Chattopadhyay et al. 2006; Hoem 2013; Nedoluzhko and Andersson 2007; Toulemon 2006). Migration is associated with economic, social and psychological costs, all of which may disrupt childbearing (Kulu 2006). A related explanation is that migration is interrelated with partnership formation (Milewski 2010). This family formation (interrelated events) hypothesis predicts that partnership, and its link with migration, is the dominant mechanism in explaining migrant fertility. For example, childbearing may be disrupted for unpartnered migrants because their partnership formation is delayed by the difficulties of finding a partner in the new destination. Delays in childbearing may also occur in the case of marriage migration, as partners 'wait' until after arrival before starting a family, or where fertility is postponed until after the arrival or return of an already committed partner. Anticipation and family formation may be considered a means of explaining disruption, although we note that family formation is sometimes considered as a competing hypothesis (Milewski 2010). In any event, anticipation is likely to play a much smaller role in forced migration, and partnership will be considered in our analysis.

A further requisite for testing disruption is the need to take a longitudinal perspective. Disruption might lead to a temporary reduction in the probability of becoming a parent or having a birth, which implies a material impact on the tempo of fertility, but no impact on completed fertility. However, disruption could be more permanent, such that it has a material impact on completed fertility. As such, we argue that a comprehensive evaluation of disruption not only requires comparisons between migrants and non-migrants in some aspect of fertility, but also to investigate interrelationships between quantum and tempo effects by birth cohort and over age. This is what we do here, using longitudinal population-register data for the entire Finnish population.

To summarise, there are a range of hypotheses that are typically referred to in studies of adult migrant fertility. Some of them, already discussed, focus on the impact of migration, while others focus on the effects of living in a new destination. The most prominent of these is adaptation, which predicts that migrants will undergo a process of convergence toward the average fertility behaviour in the destination with increasing duration of residence. There are numerous problems with testing adaptation for adult migrants, and it is sufficient here to mention that migrants may look like they are adapting when their fertility is actually determined by selection or disruption. When testing the disruption hypothesis, it is therefore important to be able to dismiss competing explanations like selection and adaptation. Moreover, if selection is more prevalent among adults who migrate at certain ages, then this might result in fertility profiles that look like disruption but are entirely unrelated to the experience of migration. This is one reason why some researchers have argued that studies of migrant fertility hypotheses are best carried out on child migrants who move prior to reaching childbearing age (Adserà et al. 2012; Adserà and Ferrer 2014). Such studies have found evidence of adaptation based on female immigrant fertility rates being more similar to those of native-born women for migrants who arrived as infants, as opposed to those who arrived as teenagers (Adserà et al. 2012; Adserà and Ferrer 2014).

Research question and hypotheses

Our overarching research aim is to examine whether the timing of forced migration is linked with either temporary and/or permanent differences in fertility behaviour. To answer this question, we focus on the mass-displacement of Finns during the annexation of Finnish Karelia in the 1940s, and examine whether there are differences between displaced Karelian Finns and the rest of the Finnish population with respect to both the tempo and quantum of fertility. Rather than studying only the general role of forced migration, we set out to examine differences by sex, as well as differences by age at migration. This enables us to test several hypotheses, which are summarised here and introduced in more detail below.

H1: *The timing of childbearing will be delayed by forced migration for those who are displaced after reaching childbearing ages [tempo for early adult migrants, G1]*

H2: *Completed fertility at the end of childbearing will be lower for those who are displaced during early childbearing ages [quantum for early adult migrants, G1]*

H3: *Experience of forced migration during childhood (prior to reaching reproductive age) will lead to the postponement of childbearing [tempo for child migrants, G1.5]*

H4: *Experience of forced migration during childhood (prior to reaching reproductive age) will be associated with lower levels of completed fertility [quantum for child migrants, G1.5]*

The first of these (*H1*) is an explicit formulation of the disruption hypothesis that was developed by scholars of internal migration (Hervitz 1985). The ideal (counterfactual) comparison for testing disruption is to ask what the fertility of forced migrants would have been in the absence of migration, i.e. if they did not move. Here, we estimate this counterfactual using the fertility of similar Finns who were born in areas of Finland that were not annexed by the Soviet Union, i.e. those born in present-day Finland. Given the fact that we are studying cohorts of women and men who have completed their fertility, we are also able to test whether disruption is temporary (*H1*) and/or permanent (*H2*). With respect to fertility, this is operationalised as a comparison of birth timing (i.e. temporary) and completed fertility (i.e. permanent). As noted above, most studies of immigrant fertility do not examine both tempo and quantum, let alone the relationship between them, although recent studies have highlighted the benefits of such an approach (Mussino et al. 2018; Tønnessen and Wilson 2019). Evidence shows that tempo variation in immigrant fertility is not necessarily associated with quantum variation, and vice versa (Wilson 2013).

There are several benefits of studying disruption in this context. First, the context is unusual because of its size and scale. The entire population of Finnish Karelia was forced to move to other areas of Finland following the Soviet annexation in the 1940s. Second, the differences between origin and destination are minimal. Typically, in studies of forced migration, there are considerable differences between migrants' origin area or country and their new destination in terms of culture, development and/or other factors that influence fertility. The absence of material differences in this Finnish context mean that we are able to investigate the disruptive impact of forced migration, net of many other factors that impact migrant fertility, in particular adaptation, anticipation and selection. Adaptation is premised on the existence of a difference between origin and destination, anticipation cannot have played a major role, and selection into migration must have been modest because of the exogeneity of forced migration and because the entire origin population was forced to move.

Disruption is typically predicted to occur if migration occurs after people reach childbearing ages. However, there are also theories that predict there will be an impact of migration on fertility even when the move is prior to childbearing ages. One of these is adaptation, but adaptation is only predicted to generate a difference in fertility when immigrants have a different set of cultural norms and preferences for fertility as compared with the majority of a destination population. That is not the case here. However, there is another theory that predicts there will be an impact of childhood migration on fertility, which we refer to here as the 'childhood trauma' hypothesis. This has been theorised in a number of studies of outcomes other than fertility, such as those concerned with the long-run health effects of famines and other natural disasters that occur during childhood (e.g. Doblhammer et al. 2013; Qi 2017). As theorised by Randall, the processes of flight, limbo and resettlement may impact the proximate determinants of fertility through a variety of biological, social and psychological mechanisms (2005). Following this literature, we can predict that there may be a disruption in fertility due to the traumatic experience of being forced to migrate, which may be either temporary (*H3*) or permanent (*H4*).

In the context of migrant fertility, the childhood trauma hypothesis might be seen as an extension of the disruption hypothesis for childhood migrants, although the mechanisms are likely to be different. The most commonly stated mechanism for adult migrants, net of anticipation and selection, is the disruption of partnership. Partnership is also a plausible mechanism that would explain why childhood trauma may impact fertility, for example because it makes those who experience trauma less willing or able to find a partner. Given that partnership is one of the most likely mechanisms for both the disruption hypothesis and the childhood trauma hypothesis, we make use of our ability to link both parents of each child in our dataset to examine how our results vary according to the place of birth of both parents. We are not only able to identify whether parents were born in the ceded areas of Karelia, but also whether parents were born in the same municipality. These variables will mean different things depending upon age at migration, but they nevertheless provide additional insights about the mechanisms involved. We are also able to test the role of social and spatial mobility. Lynch et al. (2019) have proposed that settlement after migration involves a trade-off between reproduction and social status. We examine this explanation, alongside the role of spatial mobility, in the final part of our analysis.

Context, data and method

A detailed description of the Soviet annexation of Finnish Karelia has been given elsewhere (Haukka et al. 2017; Lynch et al. 2019; Saarela and Elo 2016; Saarela and Skirbekk 2018). For the purposes of this study, the following summary may be sufficient. In a peace treaty that was signed in March 1940, Finland ceded roughly a tenth of its territory to the Soviet Union. The entire population of these areas was then evacuated over the following spring and summer. In June 1941, the ceded areas were re-occupied by Finland, and from the end of 1941 two thirds of those who had been displaced returned to their pre-war homes. In the summer of 1944, the entire population of the ceded areas was again forced to relocate. Since then, these areas have remained part of the Soviet Union or Russia. None of the displaced Karelians have had the opportunity to move back to the ceded areas after 1944. All of this means that these forced migrants were not selected on observed or unobserved characteristics. With respect to allocation in present-day Finland, these forced migrants were relocated in way that was not primarily based on their own subjective choice. However, the government-led settlement policy implied some sorting on the basis of characteristics. All evacuated families consequently had the right to receive a new home, new land, or compensation in proportion to their former circumstances. This resulted in a situation where migrants had fairly similar socioeconomic profiles immediately before and after relocation, including as compared with people living on the Finnish side of the new border.

Our data come from the Finnish population registers, which cover the entire resident population of Finland from the end of 1970 onwards. These registers allow us to identify persons who were born in the ceded areas and those who were not. The former are all assumed to be forced migrants, which can be justified by the very low levels of internal migration from ceded areas that occurred prior to 1940. Our data also allow us to link all members of our study population to their children as long as they, and their children, were alive and resident in present-day Finland, and lived in the same household, at the end of 1970. These linkages then allow us to calculate the childbearing history of parents. In essence, our observation window starts in 1970, such that people who died or emigrated from birth until 1970 are not included in the data. This is an important source of potential bias, which we investigate using supplementary analysis. We use a 10% sample of data from the 1950 census to explicitly study if there is selective drop out (emigration or death) in the 1950s and 1960s for displaced persons, as compared to non-displaced persons. As shown in the appendix (Figure A1), we find no such evidence.

Our data provide high quality estimates of childbearing over the entire life course, as well as information on municipality of birth, birth cohort, age at migration, sex, and several control variables: homeownership, education, socio-economic status and income. These are measured at ages 46-50 (due to the use of quinquennial censuses for values of these controls prior to 1987). We also have information on the municipality of birth for the other parent of an ego's children. We provide a detailed discussion of data quality in a supplementary note in the appendix, which also highlights the benefits of our data as compared with the samples that have been used in prior studies of this forced migration. The appendix also shows that fertility is underestimated for earlier born cohorts, and particularly for those born before 1920 (Figures A2-A5). Our study population therefore includes only those who were aged 20 or younger at the time of first forced migration (in 1940).

In addition to using these full population data, we also make use of a 10% sample from the 1950 census, which we combine with the full population data in order to examine social and spatial mobility. More specifically, we examine the role of changes between 1950 and 1970 in different variables, including whether people live in the same municipality, or in a city, or in Helsinki, and changes in their socio-economic status based on occupation, education, and homeownership. Although this data source provides greater flexibility than using the full-population data, it provides less statistical power. A detailed overview of data quality regarding this sample is given in the appendix (including Table A1), and here it is sufficient to say that we find no evidence of bias in its estimates of fertility and no evidence that we believe would invalidate our conclusions.

We begin by estimating the average number of children ever born at each childbearing age from 15-45 alongside several other fertility measures. This is done separately for women and men from different birth cohorts, according to whether they were born in the ceded areas of Finland or not. These numbers allow us to examine age profiles of children ever born, age profiles of parenthood, differences in completed fertility (measured at age 45, except in Table 1) by age at first forced migration comparing with persons born in present-day Finland, and differences in children ever born by age and age at first forced migration comparing with persons born in present-day Finland. We carry out further analysis to control for various potential confounding factors. Differences in completed fertility are estimated using a series of Poisson regression models with controls for homeownership, education, income and socio-economic status, measured at age 46-50. We then use the 10% sample from the 1950 census to estimate differences in completed fertility controlling for social and spatial mobility between 1950 and 1970, and whether other parents were born in the ceded area (or not) and/or the same municipality (or not), which can be interpreted as a measure of assortative mating.

Results

Table 1 provides summary statistics of fertility for women and men born in the ceded areas (forced migrants) and those born in present-day Finland. These estimates are based on the total population for cohorts born between 1927 and 1944, which not only means that those born in the ceded areas were forced to migrate as children, but also makes the results in this table comparable to those that were produced using a sample of the population in Saarela and Skirbekk (2018) and Saarela and Elo (2016). Our estimates of fertility – the percentage with children at age 45, the mean number of children at age 45, and the mean age at birth of first child – are similar to those of previous research.

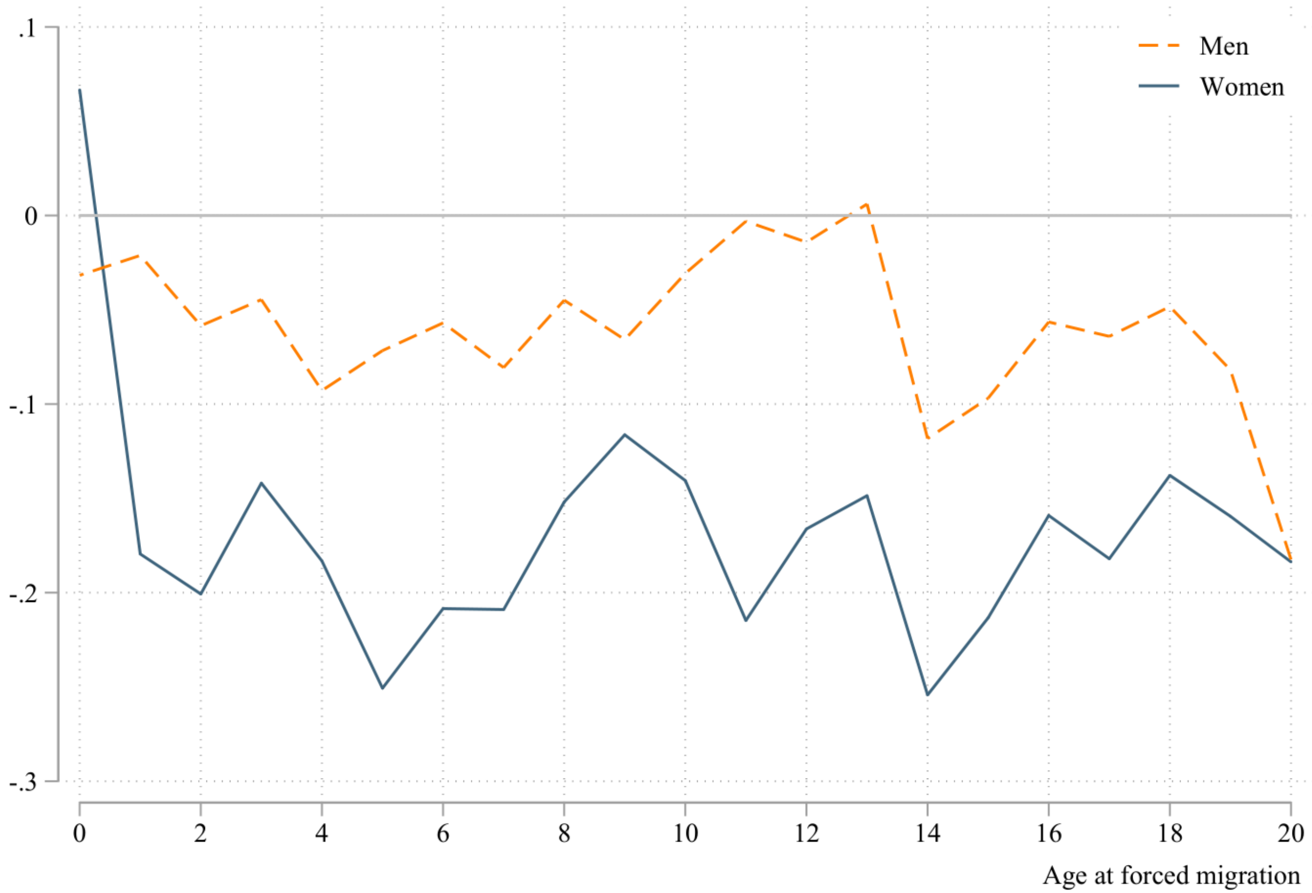
Table 1

Descriptive statistics for women and men born 1927-1944 in the ceded areas and present-day Finland

	Egos born in ceded areas			Egos born in present-day Finland		
	All	Other parent born in ceded areas	Other parent born in same municipality in ceded areas	All	Other parent born in ceded areas	Other parent born in same municipality in present-day Finland
WOMEN						
Total number of individuals	44,879	5,625	1,529	485,662	33,870	92,663
% with children	82.4			84.2		
Mean number of children	2.03			2.13		
% with other parent born in ceded areas	12.5			7.0		
% with other parent born in same municipality	3.4			19.1		
Mean number of children, parents only	2.46	2.54	2.67	2.53	2.53	2.79
Mean age at birth of first child, parents only	24.7	24.5	24.2	24.4	24.2	23.6
MEN						
Total number of individuals	45,914	4,419	1,145	502,792	24,547	92,751
% with children	80.0			78.9		
Mean number of children	1.95			1.95		
% with other parent born in ceded areas	9.6			4.9		
% with other parent born in same municipality	2.5			18.4		
Mean number of children, parents only	2.43	2.51	2.61	2.47	2.48	2.65
Mean age at birth of first child, parents only	26.9	26.4	26.3	26.8	26.1	26.4

Note: If the ego has children with more than one partner, 'Other parent born in ceded areas' refers to any other parent. The other parent cannot be identified for 135 of the fathers born in the ceded areas, 1,141 of the fathers born in present-day Finland, 1,888 of the mothers born in the ceded areas, and 17,146 of the mothers born in present-day Finland. Unlike the rest of the article, fertility is measured in this table in 2015 (to be more comparable with prior research).

Figure 1
Difference in completed fertility between forced migrants (those born in ceded areas) and people born in present-day Finland



Note: Negative numbers indicate a lower level of completed fertility for forced migrants who were born in ceded areas. Estimates are for the whole population.

The upper panel in Table 1 is for women (female egos) and the lower panel is for men (male egos). The results show that forced migrants were much more likely to have children with another person born in the ceded areas (13% of women, versus 7% for women born in present-day Finland, 10% vs. 5% for men). However, from the perspective of municipality of birth, those in present-day Finland were much more likely than forced migrants to have children together with someone born in the same municipality (19% vs. 3% for women, 18% vs. 3% for men). With respect to fertility, we see that male forced migrants are slightly less likely than those born in present-day Finland to be childless (20% vs. 21%), but have the same completed fertility at age 45 (1.95). For women, differences in fertility are much more apparent. Female forced migrants tend to have lower fertility rates than women born in present-day Finland. They are more likely to be childless (18% vs. 16%) and have a lower completed fertility (2.03 vs. 2.13).

In Figures 1 and 2, we show differences between these two populations, in terms of quantum and tempo effects, with a focus on age at migration. Figure 1 does this for completed fertility, thereby testing *H2* and *H4* (the quantum hypotheses), and Figure 2 does this at all childbearing ages, thereby testing *H1* and *H3* (the tempo hypotheses) and helping to show at which age(s) any quantum differences appear.

In summary, there is evidence of a strong disruption of fertility, at least for women. Figure 1 shows that female forced migrants had lower levels of completed fertility than similar female Finns who were not displaced, and this is true for all ages at migration from 1 to 20, suggesting a permanent and pervasive disruptive effect. The outlier is women who were born in 1940 – i.e. the same year as the first evacuation – who showed no difference. The results for men are weaker and show no differences for those who were displaced in their early teenage years (around the onset of puberty), thereby suggesting that the impact of forced migration is highly gendered, at least in this context.

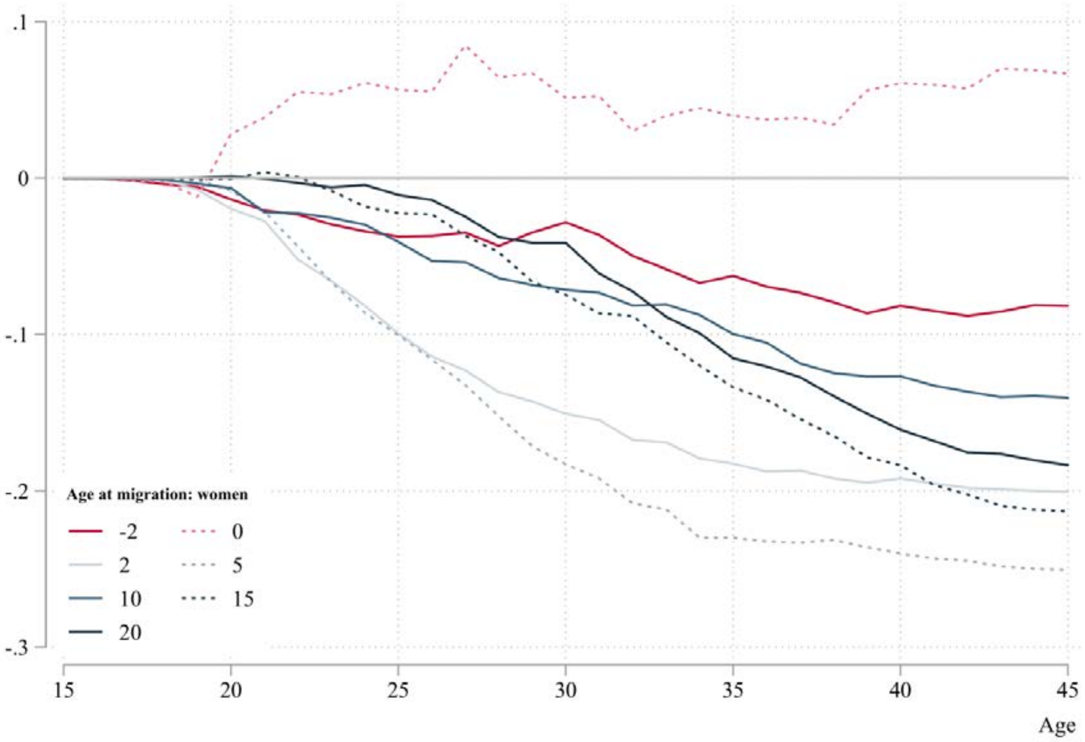
Figure 2 shows the age-profile of differences in children ever born between fo4rced migrants and those born in the same year in present-day Finland. As such, it shows the relationship between differences in completed fertility at age 45 and differences in number of children born earlier in the reproductive life course. This enables an evaluation of whether disruption due to forced migration is temporary and/or permanent. The figure shows how the age-profile of differentials varies by age at migration. It also shows results for those born in the ceded areas in 1942, which was two years after the first forced migration (therefore shown as a negative age at migration). This group are the children of those who returned to ceded Karelia, only to have to permanently return to present-day Finland in 1944.

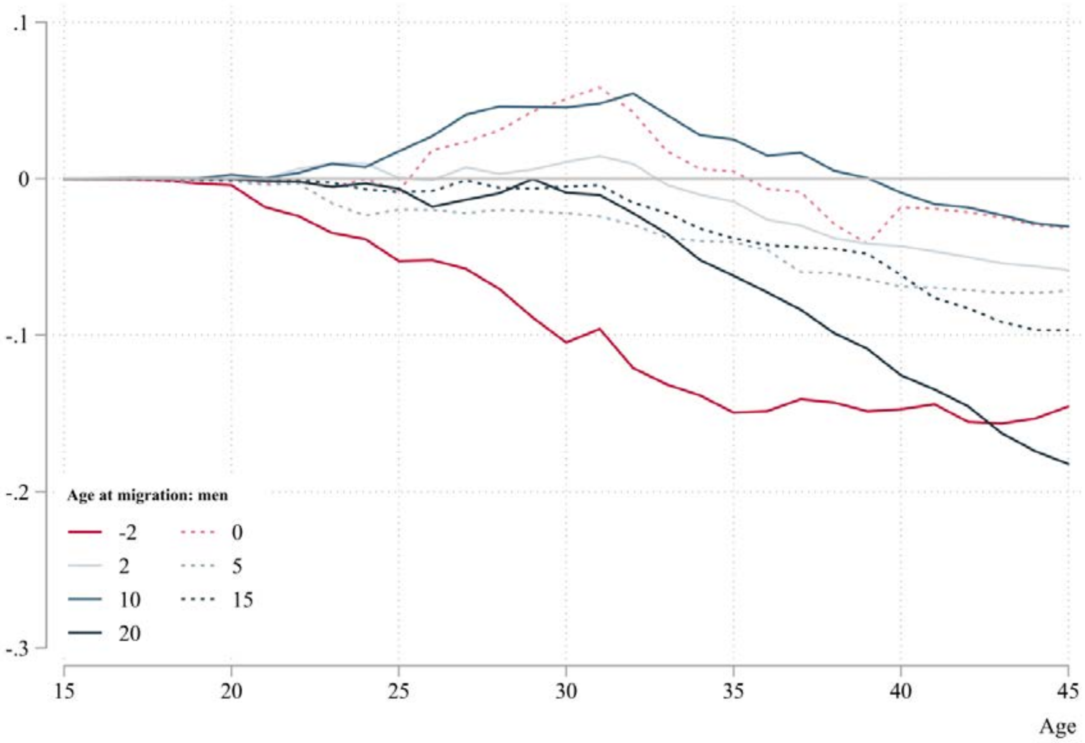
For women, there is evidence that disruption begins to occur well before age 30, and that there is a gradually increasing differential thereafter for most ages at migration. In order words, there is evidence that births are delayed, i.e. a tempo effect, and in some cases forgone, i.e. a quantum effect. In essence, we find some support of all four hypotheses for women (*H1*-*H4*), meaning that, rather than a temporary change in childbearing, forced migration is associated with a permanent disruption in childbearing for women in this context. The exception is women who were born in the same year as the first evacuation.

For men, the results in Figure 2 are perhaps more consistent than they appear in Figure 1, in the sense that the age-profile of childbearing follows a broadly similar pattern for different ages at migration. Male forced migrants tend not to exhibit any evidence of disruption until age 30. Indeed, prior to this age, some groups appear to experience an elevation in their childbearing intensity, i.e. an increase in the tempo of their fertility. However, this is not the case for those who migrated at age 20, after reaching childbearing, for whom there appears to be no difference until after age 30. This is evidence against *H1*. After age 30, there is a relative decrease in the number of children ever born, suggesting a reduction in tempo, which in most cases results in a level of completed fertility below that of men born in present-day Finland, albeit with differentials that are notably smaller than for women. For men, therefore, we find evidence in support of the quantum hypotheses (*H2* and *H4*), but generally smaller differences than for women. Moreover, contrary to the results for women, we find evidence against the tempo hypotheses (*H1* and *H3*), with relatively little variation in the relative profile of fertility by age at migration. The notable outliers for men are those who migrated after reaching childbearing age, i.e. age 20, and those born in ceded areas in 1942, after the first displacement. Both these groups exhibit a lower completed fertility, on a par with the differentials observed for women. They are however different from each other in their age-profiles of relative fertility.

Figure 2

Difference in children ever born between forced migrants (those born in ceded areas) and people born in present-day Finland

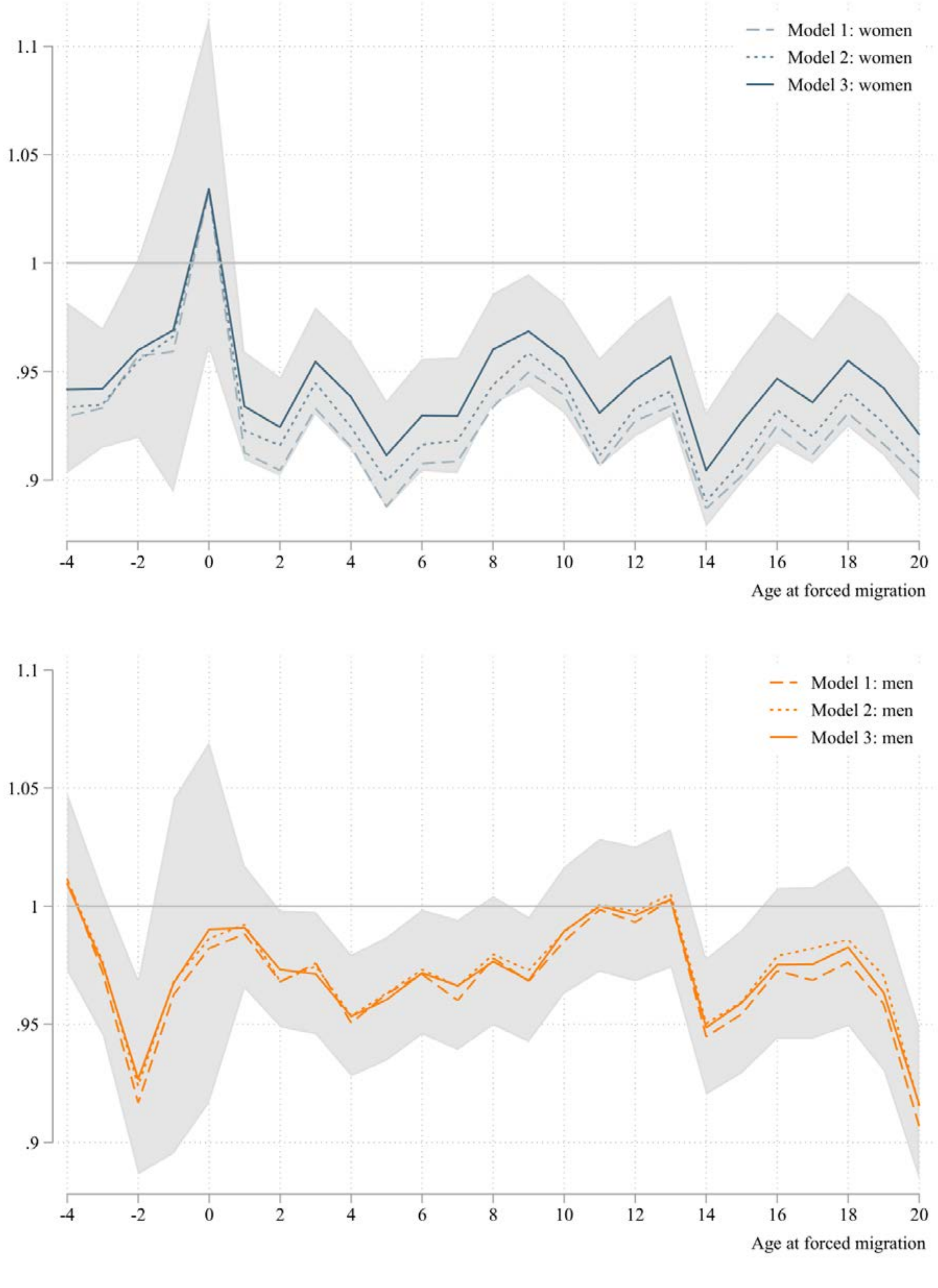




Note: Negative numbers for the different in children ever born indicate a lower level of completed fertility for forced migrants who were born in ceded areas. Age at migration '-2' represents those born in 1942, two years after the first forced migration. Estimates are for the whole population.

Figure 3

Ratio of completed fertility comparing forced migrants (those born in ceded areas) and people born in present-day Finland



Note: Model 1 has no controls. Model 2 controls for home ownership and education. Model 3 is the same as model 2 with additional controls for socio-economic status and income. All controls measured at age 46-50. The outcome in all models is completed fertility at age 45. The grey shaded are indicates the range of 95% confidence intervals estimated for model 3. Estimates are for the whole population.

The role of spatial and social mobility

Having established that there is evidence of disruption, in particular for women, we can examine whether this evidence is explained by spatial and social mobility. This is particularly relevant given the conclusion of prior research, which concluded that settlement after migration for forced migrants from Finnish Karelia involved a trade-off between reproduction and social status (Lynch et al. 2019).

Figure 3 shows the results of a series of Poisson regression models, including one that re-estimates the results in Figure 1 but with controls for homeownership, education, socio-economic status and income (Model 3). Our main conclusion is that these factors do not explain the patterns of completed fertility by age at forced migration discussed above (and shown in Figure 1). The use of a generalised linear model also allows the estimation of the relative risks (shown in Figure 3), as opposed to the differences in number of children born (shown in Figures 1 and 2), and the standard errors of the parameters estimated. We provide 95% confidence intervals, but want to stress that because the data cover the entire population, these should be seen as providing an overview of the spread of the relative risks, rather than serving as a means for statistical hypothesis testing.

Figure 3 also extends Figure 1 to show the results for those who have a negative age at migration. As in Figure 2, this represents the difference for those who were born in the ceded areas after 1940. These people were not yet born during the first evacuation, but experienced the second evacuation when they were aged under five. For both men and women in this group, there is strong evidence of quantum disruption. However, the results are somewhat different for those who experienced the first or second evacuation at the same age. For example, women who were born in the same year as the second evacuation (1944) do not have the same elevated (relative) completed fertility as those who were born in the same year as the first evacuation (1940). This may relate to the fact that the first evacuation was less anticipated and more materially significant for people's lives.

In addition to the sensitivity analysis referred to above, we carry out a more nuanced analysis of the role of social and spatial mobility using the 10% sample of the 1950 census (Tables A2-A4 in the Appendix). Here, we focus on the results for women, as there was no difference between male forced migrants and men born in present-day Finland when pooling all ages at migration.

The analysis for women suggests that it is not social mobility per se that determines fertility – for example moving to Helsinki, or from a blue-collar to a white-collar occupation – but rather social position toward the end of childbearing. The ratio of completed fertility for female forced migrants, relative to those not forced to move, is only partially reduced (from 0.90 to 0.94) after the addition of a full set of controls for social and spatial mobility. This suggests that our findings are not explained by the initial location of allocation, internal migration after displacement, initial socio-economic status, or changes in socio-economic status. This finding is in contrast to the argument of Lynch et al. (2019), although we note that the estimated ratio for women does attenuate further (to 0.96-0.98) after the addition of fixed and random effects at the municipality level (in 1950 or 1970; both were analysed). We interpret this to mean that the fertility of forced migrants will be determined, to some extent, by factors relating to where they live, and their subsequent mobility, after displacement. Nevertheless, this is clearly not the only explanation for the disruption of their fertility.

Another potential explanation is that of assortative mating. Here, we investigate this by examining the interaction between area of birth for both parents (Table A3). It appears to explain some of the disruption, based on the fact that differentials are largest for female forced migrants who had children with male forced migrants, conditional on spatial and socio-economic controls. However, differentials are of a similar magnitude for female forced migrants who had children with men from present-day Finland. At most, this suggests only a minor influence of assortative mating on disruption.

Discussion

Forced migration may have both temporary and permanent consequences for those who are displaced. However, long-run consequences are hard to evaluate in many settings due the lack of suitable data, especially for outcomes like completed fertility, which can only be measured once people approach the end of their reproductive careers. Even when the fertility of forced migrants is measured, it is rarely measured for men. Here, we have examined whether female and male forced migrants experience a temporary disruption in their childbearing, a permanent disruption, or no disruption at all. This was made possible by examining differences in both the quantum of fertility at the end of childbearing (at age 45), and the tempo of fertility, by analysing children ever born longitudinally by age. Using information on birth cohort, we have estimated how fertility varies according to the age at which men and women experienced displacement. This approach allowed us to investigate the role of age at migration, as required for testing the four hypotheses we derived from the theoretical literature on migrant fertility.

In summary, we find consistent evidence in support of a permanent disruption of fertility, at least for women. Female forced migrants have (relatively) delayed fertility at all ages, suggesting both a tempo and a quantum effect. Completed fertility is estimated to be lower by between 0.1 and 0.3 children, depending upon age at migration. Although this difference might appear small, we note that it is material in the context of prior studies of migrant fertility, for example when comparing the completed fertility of foreign-born and native-born women living in the UK (Wilson 2019). The exception is women who were born in the year of the first evacuation (in 1940). In this case, we observe elevated fertility. This may be due to any disruption being counterbalanced by a fertility-increasing effect for people who are in-utero during a humanitarian ‘crisis’. However, we note that there is little evidence for this from other studies that compare proximate birth cohorts of women (Lumey 1998).

Evidence of disruption for men is less clear. In particular, contrary to the expectations of our hypotheses, the tempo of male forced migrant fertility, relative to Finns who were not forced to move, actually increased before age 30. Indeed, our results suggest that the impact of forced migration on both the tempo and quantum of fertility is highly gendered. The greatest similarity between men and women is for those who migrated at age 20, who have a similar differential in terms of completed fertility. This group correspond with those who have been most frequently studied in the literature on (non-forced) migrant fertility because their migration occurs in the years during which they could be forming a family, either having a child or finding a partner, or both. As such, we find considerable evidence in support of the disruption hypothesis, as it is most often discussed in studies of migrant fertility (Hervitz 1985; Milewski 2010). This is the case when we examine completed fertility (i.e. support for *H2*), although men do not exhibit any difference in birth timing prior to age 30 (i.e. evidence against *H1* for men). For those who migrated during childhood, there is evidence of a quantum and tempo disruption for women (i.e. evidence for *H3* and *H4*), but less so for men, especially prior to age 30. Indeed, for men who migrated close to puberty (ages 10-13), there appears to be no evidence of disruption for any aspect of fertility. This finding suggests that puberty may be a critical age for migration, or at least forced migration, for men.

Prior research on the same setting has concluded that settlement after forced migration involves a trade-off between reproduction and social status (Lynch et al. 2019). Our findings caste doubt upon this conclusion, essentially because we find that evidence of disruption persists after controlling for social mobility. As described in the appendix, this may in part relate to the selectivity of the sample data that was used in this prior research. That said, we find some attenuation of the differences between female forced migrants and women born elsewhere in Finland, especially after controlling for spatial mobility in addition to (changes in) socio-economic status. Previous research on this context has shown that many forced migrants moved within Finland after they had been relocated. In 1950, ten years after the first displacement, roughly half of the displaced population lived in their designated placement areas (Waris et al. 1952). Several decades after displacement, men who had moved internally within Finland earned more than those who stayed in their designated area (Sarvimäki et al. 2009). Although social mobility may not explain the results, such moves may have been easier for men than women, which may in turn explain some of the gender differences that we observe.

We also showed that assortative mating, based on the birthplace of the other parent, provides at best only a partial explanation for the different fertility of female forced migrants. In some cases, having a partner who was also a forced migrant may mean that the whole family moved together (unfortunately we do not have information on this) but given the young ages of migration in our study population, it is more likely to represent assortative mating after migration. It may be tempting to conclude that our results suggest a magnification of the impact of forced migration when both parents are forced migrants, for example due to both experiencing childhood trauma. However, we note that it only appears to be the case for women, and only after controlling for social and spatial mobility. The effect of assortative mating is therefore somewhat ambiguous, although it may reflect the role of local and social networks after migration in determining partnership behaviour. Forced migrants were allocated across Finland, but those from the same neighbourhood were often allocated to the same area of present-day Finland. Indeed, the settlement patterns of forced migrants after displacement, and their subsequent migration, may be an important aspect of whether our findings generalise to other contexts.

We have already noted some of the other potential limitations of this study, and they are further discussed in the Appendix. Fertility was estimated based on linkages between parents and children for those who were in the register at the end of 1970. If anything, this means that estimates of children ever born are biased downwards due to the mortality and emigration of either parents or children, and if children had moved out of the parental home before the end of 1970. However, for the younger birth cohorts we have analysed, these issues are not likely to bias the results to any noteworthy degree. Another limitation is that we only know if people were born in ceded Karelia, so we don't know if they left ceded Karelia prior to 1940. Based on the 1950 census, we observed some internal migration prior to 1940, albeit at a low rate that cannot affect the results Table A1 in the Appendix). A further limitation is that we do not know whether persons born in the ceded areas (before 1940) were forced to move once or twice. The first evacuation was in 1940 and the second in 1944. There were relatively few children born in ceded Karelia from 1940-1944 (Saarela and Elo 2016). The result for this group, with negative durations in Figures 2 and 3, should therefore be treated with some caution, and may be harder to generalize.

With all this in mind, we recommend that future research attempts to evaluate the generalisability of our results, as there remains scant knowledge about the completed fertility of forced migrants in other contexts. The validity of our findings is partly based on the similarity between origin and destination in this study, which means that we are able to show the disruptive impact of forced migration, net of other factors that impact migrant fertility, including adaptation, anticipation and selection. This is useful in order to isolate disruption, but it also prevents an understanding of whether disruption is different for women and men whose migration is (more) planned in advance, such as those who migrate for work or to reunite with their family. For example, it may be that this study isolates the impact of migration itself, but fails to capture any disruption that could be caused by the anticipation of migration. At the same time, it is also possible that the disruptive impact of forced migration varies depending upon the precise combination of origin, destination, and reason for being forced to move, for example depending upon the reception of forced migrants in their new destination. In this context, forced migrants were supported by the government expected to integrate into society as there were no possibilities to return migrate after 1944 (Loehr et al. 2017; Saarela and Finnäs 2009). This is unlikely to always be the case. Nevertheless, this study adds to existing evidence that suggests the impacts of forced migration may reach many years into the future (Saarela and Finnäs 2009). We have focussed on forced displacement within existing national boundaries due to conflict, a situation that remains all too prevalent for many contemporary populations who are internally displaced (UNHCR 2016). The long-term consequences of recent displacements remain to be seen.

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Appendix

Supplementary Note: Detailed information on the data and study population

Our data come from the Finnish population registers, which cover the entire resident population of Finland from the end of 1970 onwards. These are high-quality data, but not without issues and nuances, which we will discuss in this part of the Appendix. We have measured completed fertility at age 45 (except for in Table 1, where it is measured in 2015) subject to these limitations. Extending the age threshold would have only marginal implications for the results reported, however. The data allow us to identify persons who were born in the ceded areas and those who were not, and to link all of these people to their children as long as they, and their children, were alive and resident in present-day Finland, and lived in the same household, at the end of 1970. These linkages then allow us to calculate the childbearing history of each parent by age and birth cohort. However, it needs to be stressed that the actual observation window for the full-population data starts at end-1970. Persons who died or moved abroad from birth until end-1970 are not included in the data, nor are children who had left the parental home before the end of 1970.

Figure A1 makes use of the register data that are available prior to 1970, a 10% random sample of the population from the 1950 census. It shows the share of persons in the 1950 census (based on the 10% random sample) who cannot be observed in the 1970 census or later (based on data for the entire population). If they are not present in 1970 they had either died or emigrated (and never return migrated to Finland). Such persons can roughly be divided into two groups. One consists of persons who disappeared and never received any PIN number, who can be assumed to have died or emigrated in the 1950s, before the PIN number was introduced in the 1960s. The other group consists of persons who disappeared but received a PIN number and can, consequently, be assumed to have died or emigrated in the 1960s. By comparing persons born in the ceded areas with persons born in present-day Finland, we can assess whether they differ with regard to mortality and/or emigration in 1951-1970. Our judgement based on these descriptive results is that this is not the case. Attrition from the 1950 census is close to identical when comparing persons born in the ceded areas with persons born in present-day Finland, although the patterns seem to differ somewhat for persons born in 1940-1944.

Another data issue is that the link between children and parents does not exist if the child had moved out of the parental home before the census in 1970. This means that problems are minimal with regard to births from 1953 and thereafter (as the children were aged less than 18 in 1970). For children born before 1953, there are no links unless the child still lives at home, meaning that fertility will be depressed, and more so for the earlier-born cohorts of parents (and children). We cannot do anything about these data issues, as the data we have are the best that are available for Finland. For persons born around the mid-1930s and later (aged 18 and younger), the data limitations should have practically no consequences. For those born before the mid-1930s, there are consequences for overall fertility, but with regard to the differentials between forced migrants and non-migrants, this is only an issue if the two groups differ in terms of the ages that their children (born before 1953) left the parental home. As discussed in the main text, and illustrated in the analysis in the rest of this appendix, overall levels of fertility appear to be underestimated for cohorts born before 1920. We have therefore analysed only those people who were born in 1920 or later, i.e. those aged 20 years or younger at the time of first forced migration (in 1940).

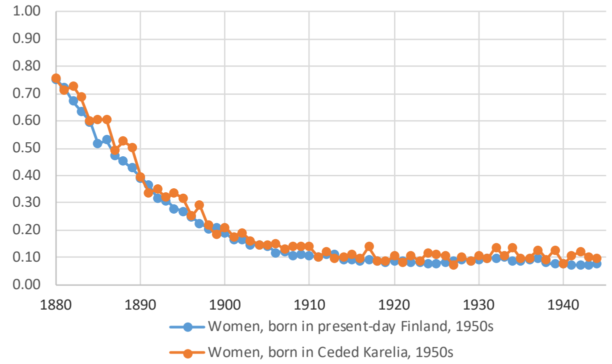
Prior studies of fertility in this setting (Lynch et al. 2019; Saarela and Skirbekk 2018) have used a retrospective approach similar to ours and, thus, suffer from similar problems as described above. Saarela and Skirbekk (2018) used a small but representative population-register sample, thereby making the analysis somewhat underpowered. They studied persons who were forced to migrate at age 17 years or below, but did not explicitly analyse differences by age at migration. Due to a lack of data on both parents, unless the parents lived together in 1988 or later, they were also only able to partially incorporate measures of assortative mating, and they had no information about the municipality of birth of any person, which we have here. The paper by Lynch et al. (2019) also suffers from a paucity of data. It was based on structured interviews that took place between 1968 and 1970. The study analysed individuals who were aged between 14 and 70 at the time of the first evacuation and who had complete information on the variables required for the analysis. Apart from the problems of measuring fertility, it is not clear if the restriction to persons with complete information on key variables, such as marital status, is a significant source of bias. In addition, there may also be bias due to measurement error and misreporting, which is more likely to occur for older cohorts (see: Murphy 2009).

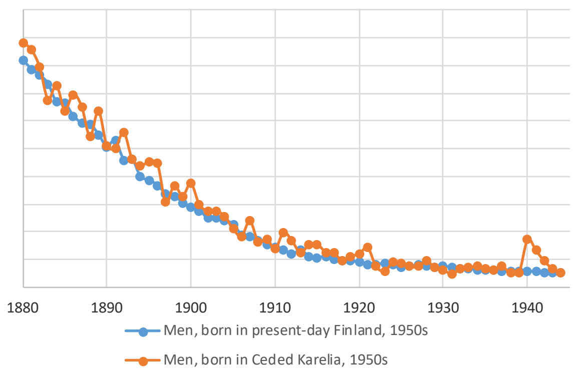
Figure A1

Proportion of persons in the 1950 census who cannot be observed in the 1970 census (i.e., who died or emigrated), by sex, year of birth, area of birth, and presumable decade when lost from the population register

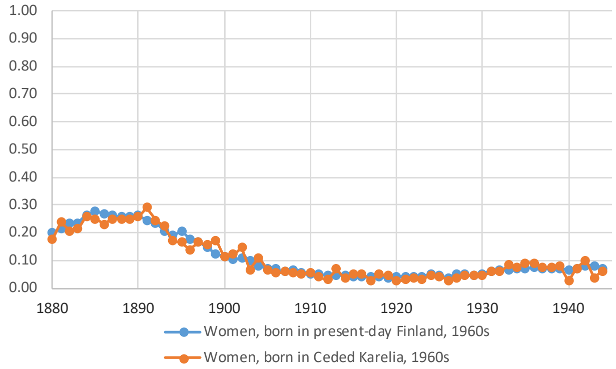
Women **Men**

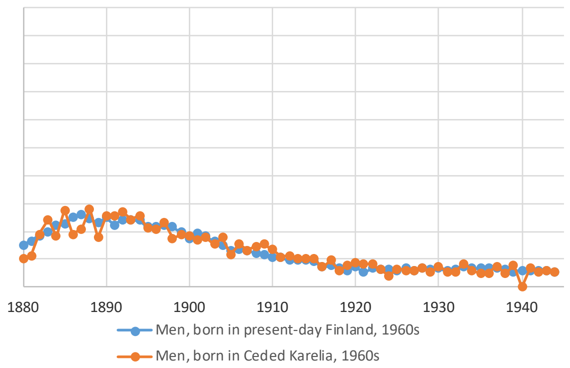
1a. Lost from the population data in the 1950s



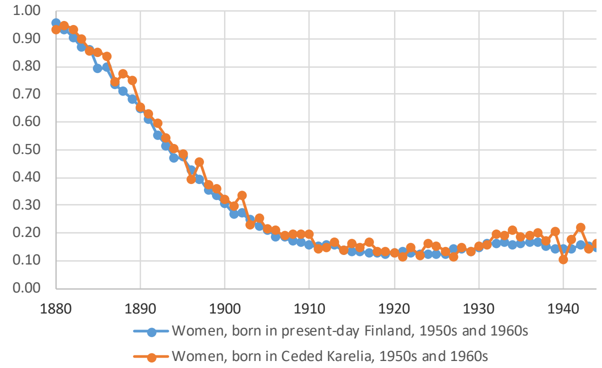


1b. Lost from the population data in the 1960s





1c. Lost from the population data in the 1950s and 1960s



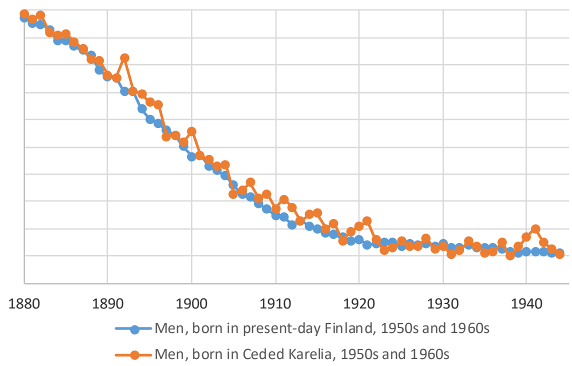
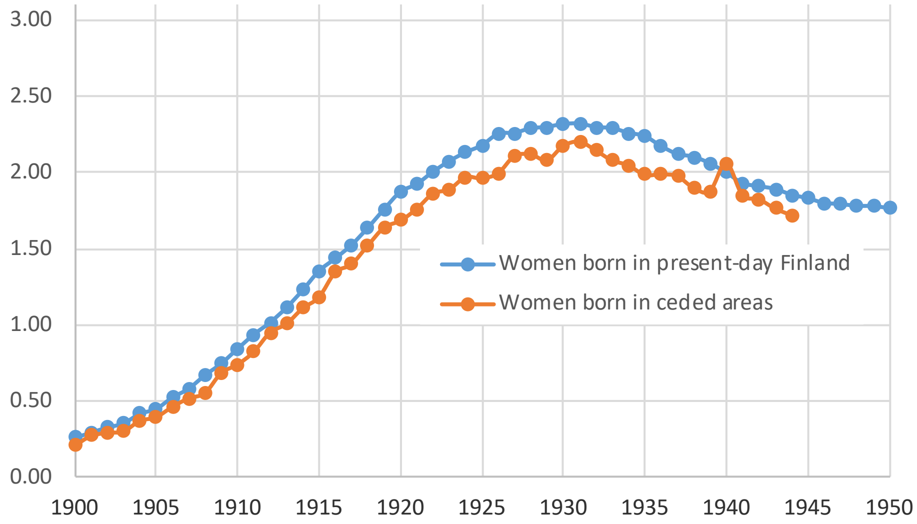


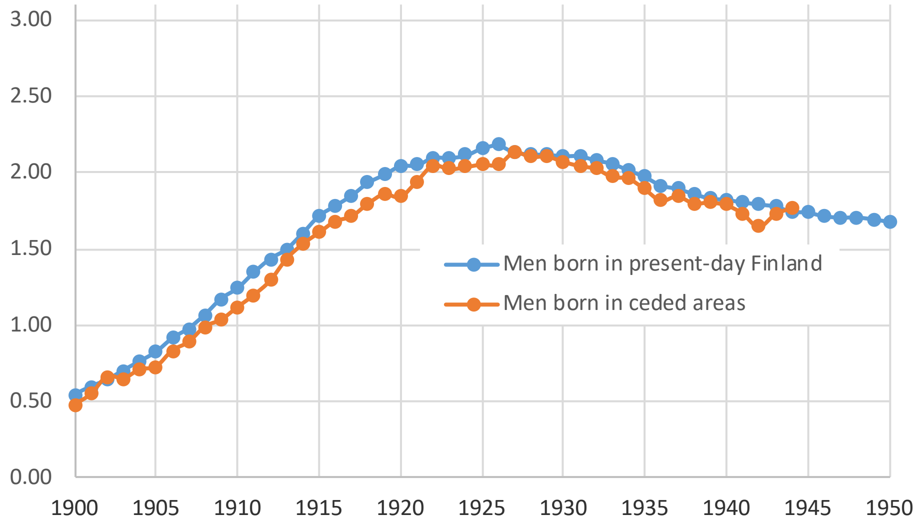
Figure A2

Mean number of children by birth cohort, sex and area of birth

Women



Men

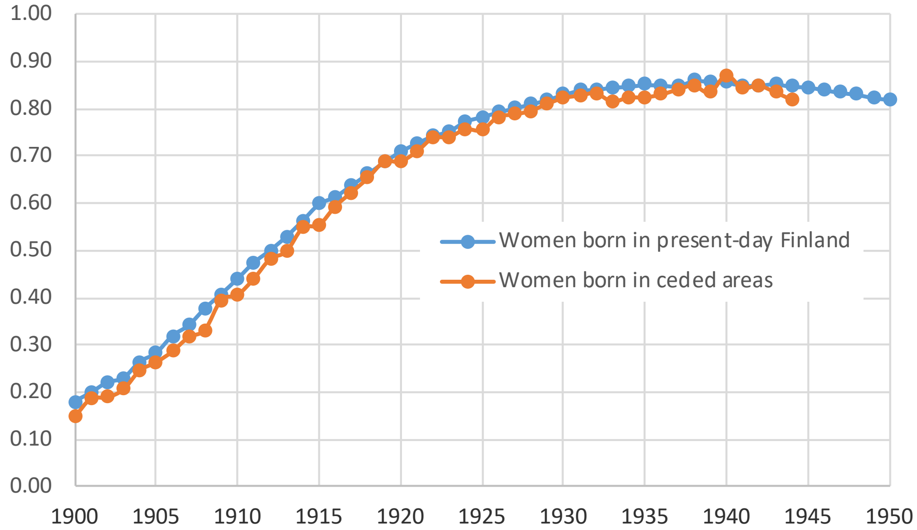


Note: No confidence intervals are shown because these estimates are for the whole population

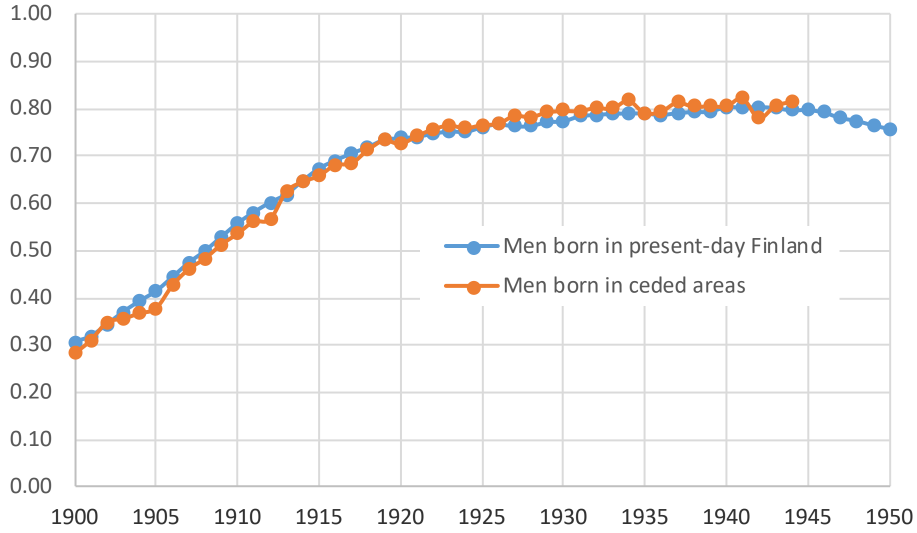
Figure A3

Proportion of persons with children by birth cohort, sex and area of birth

Women



Men



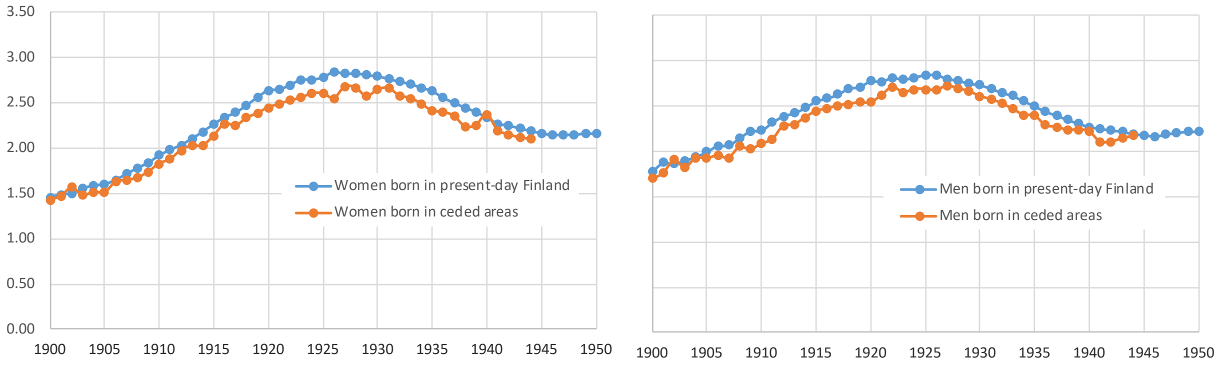
Note: No confidence intervals are shown because these estimates are for the whole population

Figure A4

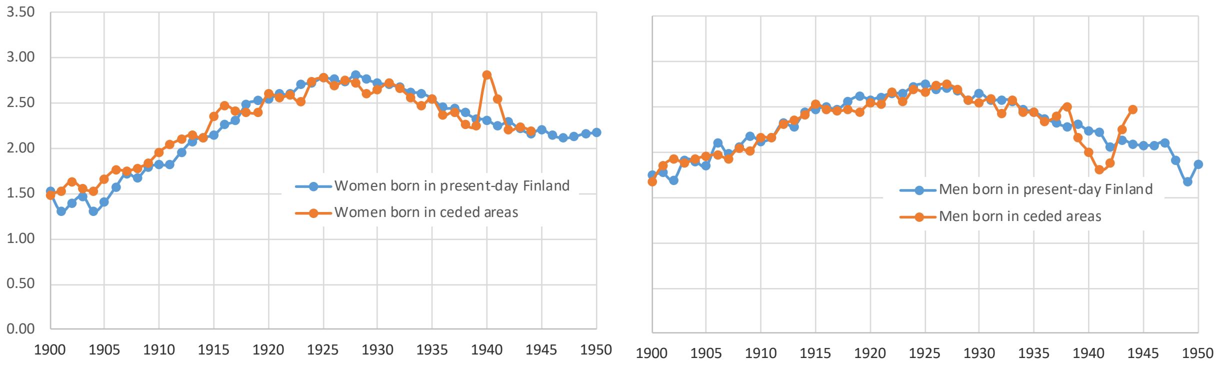
Mean number of children by birth cohort, sex and area of birth, parents only

Women **Men**

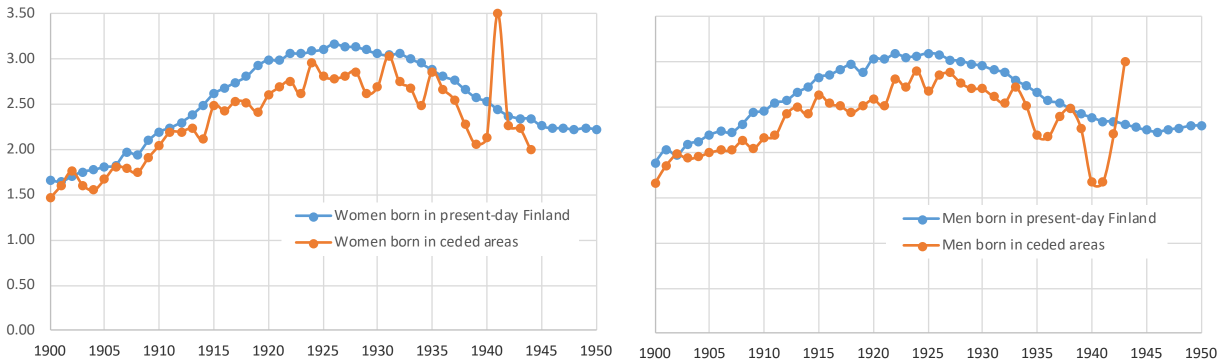
4a. All parents



4b. All parents for whom the other parent was born in ceded areas



4c. All parents for whom the other parent was born in the same municipality



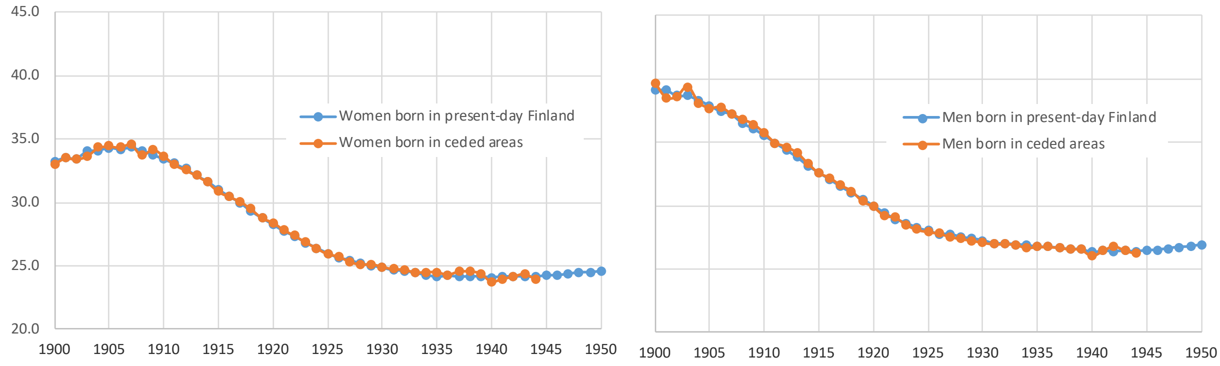
Note: No confidence intervals are shown because these estimates are for the whole population

Figure A5

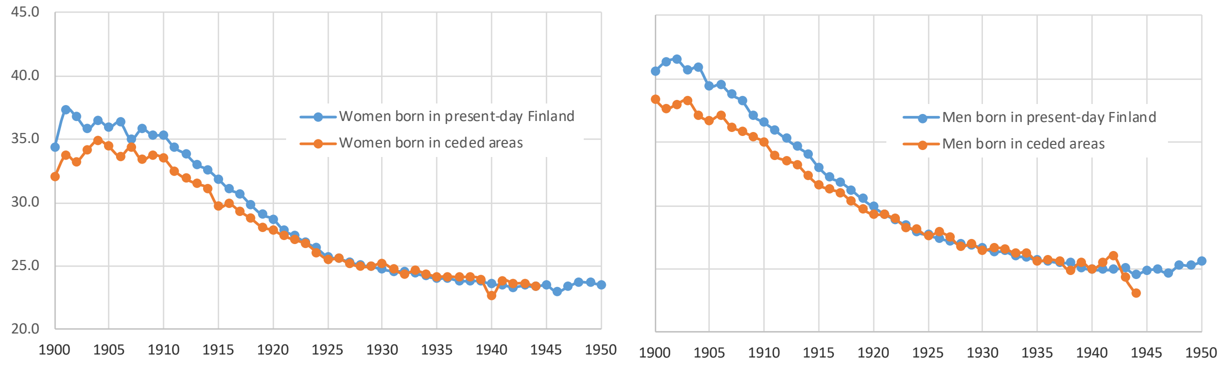
Mean age at birth of first child by birth cohort, sex and area of birth, parents only

Women **Men**

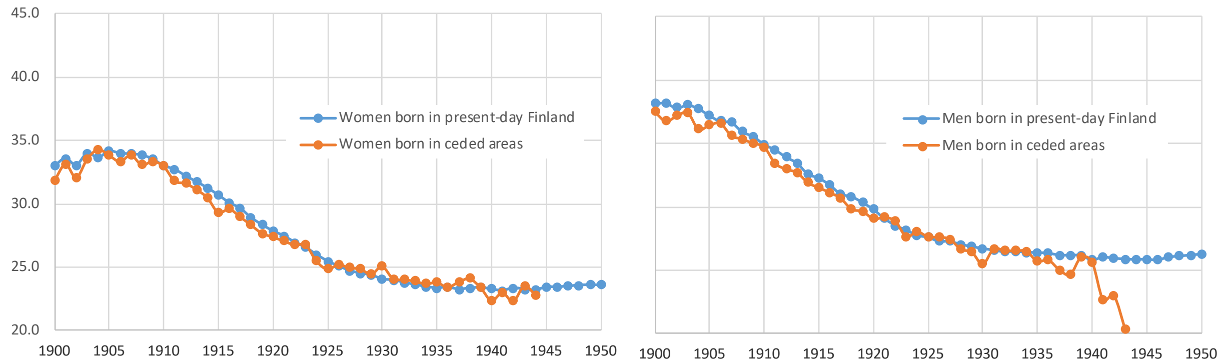
5a. All parents



5b. All parents for whom the other parent was born in ceded areas



5c. All parents for whom the other parent was born in the same municipality



Note: No confidence intervals are shown because these estimates are for the whole population

Table A1

Mean number of children at age 45 by birth area and area of residence on 1st of September 1939, men and women

	Born in present-day Finland			Born in ceded areas		
	All	1939 in present-day Finland	1939 in ceded areas	All	1939 in ceded areas	1939 in present-day Finland
WOMEN						
Mean number of children	2.19	2.20	2.08	1.99	1.99	2.01
Number of individuals	48,962	47,880	385	5,601	4,720	807
MEN						
Mean number of children	2.03	2.03	2,09	1.98	1.97	2.03
Number of individuals	49,396	48,395	345	5,731	4,953	706

Note: The description refers to persons in the sample from the 1950 census, born January 1920-August 1939. Number of individuals in the second (fifth) and third (sixth) columns do not sum to that in the first (fourth) column as some had unknown area of residence in 1939 or lived abroad.

Table A2

Models for fertility of men and women born 1920-1932 controlling for regional and social mobility 1950 to 1970

	Women				Men			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Born in Ceded Area (vs. present-day Finland)	**0.90** (0.88-0.93)	**0.94** (0.91-0.97)	**0.92** (0.90-0.95)	**0.94** (0.92-0.97)	**0.98** (0.95-1.00)	**1.00** (0.98-1.03)	**0.98** (0.95-1.01)	**1.00** (0.97-1.03)
Living in a city: 1950 to 1970								
No both years		1		1		1		1
No -> Yes		0.83 (0.80-0.86)		0.85 (0.83-0.88)		0.87 (0.84-0.89)		0.88 (0.85-0.91)
Yes -> No		0.94 (0.90-0.99)		0.97 (0.93-1.01)		1.01 (0.96-1.06)		1.01 (0.96-1.05)
Yes both years		0.81 (0.79-0.83)		0.84 (0.83-0.86)		0.90 (0.88-0.92)		0.89 (0.87-0.91)
In Helsinki area: 1950 to 1970								
No both years		1		1		1		1
No -> Yes		0.76 (0.73-0.79)		0.78 (0.75-0.82)		0.78 (0.75-0.81)		0.77 (0.75-0.80)
Yes -> No		0.92 (0.86-0.98)		0.96 (0.90-1.02)		0.90 (0.84-0.97)		0.87 (0.81-0.93)
Yes both years		0.74 (0.71-0.76)		0.79 (0.76-0.82)		0.80 (0.77-0.83)		0.78 (0.75-0.81)
In same municipality: 1950 to 1970								
No		1		1		1		1
Yes		0.95 (0.93-0.97)		0.99 (0.97-1.01)		1.05 (1.03-1.07)		1.05 (1.02-1.07)
Education: 1950 to 1970								
Primary both years			1	1			1	1
Primary -> Higher			0.87 (0.83-0.91)	0.89 (0.85-0.93)			1.06 (1.03-1.09)	1.08 (1.05-1.11)
Higher both years			0.84 (0.80-0.89)	0.92 (0.88-0.97)			1.08 (1.05-1.12)	1.19 (1.15-1.23)
Socioeconomic status: 1950 to 1970								
Blue-collar both years			1	1			1	1
Blue-collar -> White-collar			0.80 (0.77-0.83)	0.82 (0.79-0.85)			1.03 (1.00-1.07)	1.04 (1.00-1.07)
White-collar -> Blue-collar			0.98 (0.93-1.02)	0.99 (0.95-1.04)			0.96 (0.89-1.03)	0.97 (0.90-1.04)
White-collar both years			0.78 (0.76-0.81)	0.81 (0.79-0.84)			1.08 (1.05-1.11)	1.09 (1.05-1.12)
All other combinations			1.05 (1.03-1.08)	1.00 (0.98-1.03)			1.06 (1.04-1.09)	1.03 (1.01-1.05)
Homeowner: 1950 to 1970								
No both years			1	1			1	1
No -> Yes			1.13 (1.10-1.16)	1.09 (1.07-1.12)			1.10 (1.07-1.14)	1.08 (1.05-1.11)
Yes -> No			0.93 (0.89-0.96)	0.90 (0.87-0.94)			0.97 (0.93-1.00)	0.93 (0.90-0.97)
Yes both years			1.14 (1.11-1.17)	1.07 (1.04-1.09)			1.11 (1.08-1.14)	1.05 (1.02-1.08)

Note: Estimates are incidence rate ratios with 95% CIs from Poisson regressions, based on the sample from the 1950 census. The arrow (->) indicates a change between states from 1950 to 1970. Birth cohort is included as a categorical variable in all models.

Table A3

Models for fertility of male and female parents (only) controlling for the birth area of ego and the other parent (in present-day Finland or in ceded areas, plus whether born in the same municipality)

	Model 1	Model 2	Model 3
WOMEN			
Birth area of Ego and other parent (OP)			
Both present-day Finland, different municipality	1	1	1
Both present-day Finland, same municipality	1.10 (1.08-1.11)	1.03 (1.01-1.05)	1.01 (1.00-1.03)
Ego present-day Finland, OP ceded area	0.96 (0.94-0.99)	0.98 (0.95-1.00)	0.98 (0.96-1.00)
Ego Ceded area, OP present-day Finland	0.94 (0.92-0.97)	0.95 (0.93-0.98)	0.96 (0.93-0.98)
Both Ceded area, different municipality	0.93 (0.87-0.98)	0.95 (0.90-1.01)	0.96 (0.90-1.01)
Both Ceded area, same municipality	0.96 (0.90-1.03)	0.96 (0.89-1.03)	0.94 (0.88-1.01)
Controls for 1950 and 1970:			
Living in a city	No	Yes	Yes
Living in Helsinki area	No	Yes	Yes
Living in same municipality	No	Yes	Yes
Education	No	No	Yes
Socioeconomic status	No	No	Yes
Homeownership	No	No	Yes
MEN			
Birth area of Ego and other parent (OP)			
Both present-day Finland, different municipality	1	1	1
Both present-day Finland, same municipality	1.10 (1.08-1.12)	1.04 (1.03-1.06)	1.04 (1.02-1.06)
Ego present-day Finland, OP ceded area	0.98 (0.96-1.01)	0.99 (0.97-1.02)	0.99 (0.97-1.02)
Ego Ceded area, OP present-day Finland	0.98 (0.96-1.00)	0.99 (0.97-1.02)	0.99 (0.97-1.02)
Both Ceded area, different municipality	0.95 (0.90-1.01)	0.98 (0.93-1.04)	0.98 (0.93-1.04)
Both Ceded area, same municipality	1.02 (0.94-1.10)	1.01 (0.94-1.09)	1.00 (0.93-1.08)
Controls for 1950 and 1970:			
Living in a city	No	Yes	Yes
Living in Helsinki area	No	Yes	Yes
Living in same municipality	No	Yes	Yes
Education	No	No	Yes
Socioeconomic status	No	No	Yes
Homeownership	No	No	Yes

Note: Estimates are incidence rate ratios with 95% CIs from Poisson regressions, based on the sample from the 1950 census. Birth cohort is included as a categorical variable in all models. If the ego has children with more than one partner, 'Other parent' refers to any other parent.

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