Spatial trends of fertility rates in Finland between 1980 and 2014

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Abstract

Recent research has shown that in many Western countries fertility rates are highest in suburban areas and lower in urban and rural areas. Here, we illustrate the changing patterns of spatial fertility in Finland between 1980 and 2014. Fertility in Finland started conforming the high suburban pattern during the 1990's. This interestingly predates the first large scale urban sprawl (i.e., positive net migration in suburban areas) in the first decade of the 21st century in Finland.

Background

While fertility differences between countries have been extensively studied, for example, with respect to the first and second demographic transitions, less is known about spatial fertility differences within countries. Research suggests that fertility rates are generally higher in rural areas compared to urban areas, across industrialised countries (see e.g. Glusker et al., 2000; Kulu, 2006; Kulu, Vikat, & Andersson, 2007). Recently, however, several studies have moved beyond the urban–rural divide, providing a more nuanced view of geographical fertility differentials. Fertility rates seem to be particularly high in suburban areas surrounding larger cities or towns, a pattern that has been documented, for example, in the Nordic countries including Finland (Kulu & Boyle, 2009; Kulu, 2013; Kulu, Boyle, & Andersson, 2009).

The aforementioned studies concerning spatial fertility patterns in Finland only span to the beginning of the 21st century, while within-country migration patterns have changed dramatically since. During the first decade of the 21st century, Finland witnessed the first wave of a large-scale urban sprawl (see Nechyba & Walsh, 2004), i.e., decreasing population in the largest cities with simultaneous positive net migration in the surrounding municipalities (see e.g. Aro, 2014 for an illustration of the phenomenon). In the second decade of the 21st century, urban sprawl in Finland seems to have diminished, if not disappeared all together (Aro, 2014). Here, previous studies are extended by examining spatial fertility in Finland between 1980 and 2014. The long time period allows us to illustrate the changing patterns of spatial fertility, a hitherto neglected point of view (cf. Kulu & Boyle, 2009). Particularly, we pay attention to trends in suburban fertility and use information on geographic proximity of the municipalities from urban centers to distinguish more remote settlements from those municipalities which surround larger cities.

The distance between Finnish municipalities and their nearest central city or town were measured and the association between this distance and yearly total fertility rate was modelled.

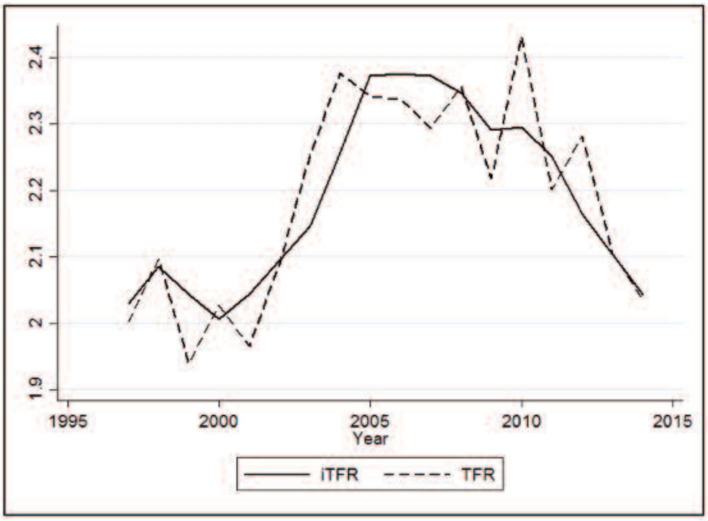
Methods

The data were from Statistics Finland and are publicly available (through http://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin/; visited on 3rd May 2016). Here, a table called “Population according to age (1-year) and sex by area 1980–2014”, was utilized. Variables used were municipalities (301 municipalities in the mainland, the Aland island was omitted because of geographical isolatedness), year, and number of women and men by age group. With the data obtained from Statistics Finland, we calculated yearly implied Total Fertility Rates (iTFR; see Hauer et al., 2013 for the deduction) for each municipality:

$$iTFR = n \times \left[\frac{\left(\frac{{}_{5}^{0}P}{5}\right)}{{}_{n}^{x}W} \right],$$

where ${}_{5}^{0}P$ is equal to Population aged 0 to 4 and ${}_{n}^{x}W$ is the total number of women aged x to x+n (Hauer et al. 2013). Here, x = 15 and n = 34, i.e., women between 15 and 49 years of age were considered to be in the reproducing population. iTFR was used instead of the more precise period total fertility rates (TFR) because information needed to calculate TFR’s was publicly available from electronic sources only from 1987 onwards. Additionally, iTFR is less sensitive to yearly fluctuations in births that may affect the TFR’s of small municipalities substantially (Fig. 1). As evident from Fig. 1, iTFR correlates strongly with TFR (see also Hauer et al., 2013).

Figure 1. An example of iTFR compared to period TFR from Kirkkonummi, Finland. Own calculations from Statistics Finland data.



The mainland of Finland is divided into 18 administrative regions. The capitals, meaning the most populated cities of each region were selected as *central cities or towns*, i.e., the center points of the assumed spatial sprawl. These cities are Helsinki, Hämeenlinna, Joensuu, Jyväskylä, Kajaani, Kokkola, Kotka, Kuopio, Lahti, Lappeenranta, Mikkeli, Oulu, Pori, Rovaniemi, Seinäjoki, Tampere, Turku, and Vaasa.

For calculating *the distances between municipalities and central towns / cities*, we defined the geographic coordinates (latitude and longitude) for each municipality and each central town by using three freely available geocoding software packages: GPS Visualizer, Google geocoding API, and the QGIS. The distances between a municipality and the nearest central town / city were then calculated by using the Haversine formula (Sinnot, 1984), which takes into account the convexity of the Earth.

To illustrate the changing spatial fertility patterns, the yearly municipal iTFR's were regressed on the municipality's distance to the nearest central city or town. The iTFR's were expected to be largest in intermediate distances, and therefore the analyses were performed by using fractional polynomial regression (see Royston & Altman, 1994; 35 separate regressions, one for each year between 1980 and 2014), to allow the associations between the distance and iTFR to be non-linear. Fractional polynomial regression allows to model a wide range of non-linear associations. The analyses were carried out with Stata 13.1 (StataCorp., 2013) by using the fp command which by default fits max. 2-degree fractional polynomial models and automatically searches the best fitting model (i.e., the model with the lowest deviance). In 33 cases, the best model produced realistic curves. In two regressions, regarding years 1980 and 1981, the model with the lowest deviance produced (probably due to some outliers) sharp edges to the curves, and a model with the next lowest deviance was chosen – the fit of these models was not statistically significantly worse than the fit of the best model.

Results and discussion

The mean implied total fertility rate was 1.88 (standard deviation 0.37, range 0.78–4.29) and mean distance to the nearest region center 51.40 kilometers (SD = 39.67, range 0–382 km). At the beginning of 1980's, fertility rates were quite similar in region centers and rural areas, differentiating towards the end of the decade (Fig. 2). During the 1980's, iTFR's were thus conforming to the typical high rural – low urban fertility pattern that has previously been observed in Finland as well as in many other Western countries (e.g., Kulu, Vikat, & Andersson, 2007). During the 1990's, the pattern appears to have changed towards lowering fertility in rural as well as urban areas, with highest fertility rates within approximately 5–15 kilometers from region centers (Fig. 3). While the drastic difference in the shape of the curves between years 1994 and 1995 (see Fig. 3) may be a statistical artefact, the change in fertility patterns evidently happened during the 1990's.

Interestingly, this pattern of highest fertility in the suburban areas seems to predate the large-scale migration from urban to suburban areas of the 2000's. During the first decade of the 21st century, fertility remained highest in suburban areas, with an overall increase in fertility rates in urban, suburban, as well as rural areas (Fig. 4). In the 2010's, fertility rates in urban and suburban areas remained stable, whereas that of rural areas seems to be on the increase once again (Fig. 5). This development might result from the rapidly increasing dwelling costs that have characterised Finland for the last 20 or so years, particularly the Helsinki metropolitan area (OSF, 2016). High dwelling costs may well drive families in search of living space to move further and further away from region centers. It is also possible that families stay in central urban areas, but do not have more children there, or that the migration from rural to urban areas has stifled, for instance due to low work incentives to do so.

Overall, it seems that the the spatial fertility patterns in Finland have converged towards a Western, industrialised pattern of high suburban fertility during the last 35 years. While urban sprawl is sometimes considered an unwelcomed phenomenon with its accompanying increased commuting traffic, pollution, and possible areal segregation (see Brueckner, 2000), the possibility of larger dwellings with lower costs still seems to be an attraction for many families.

Figure 2. Associations between yearly municipal iTFR and the municipality's distance (in kilometers) to the nearest regional center, 1980–1989. The curves are attained from fractional polynomial regression models with the lowest deviance.

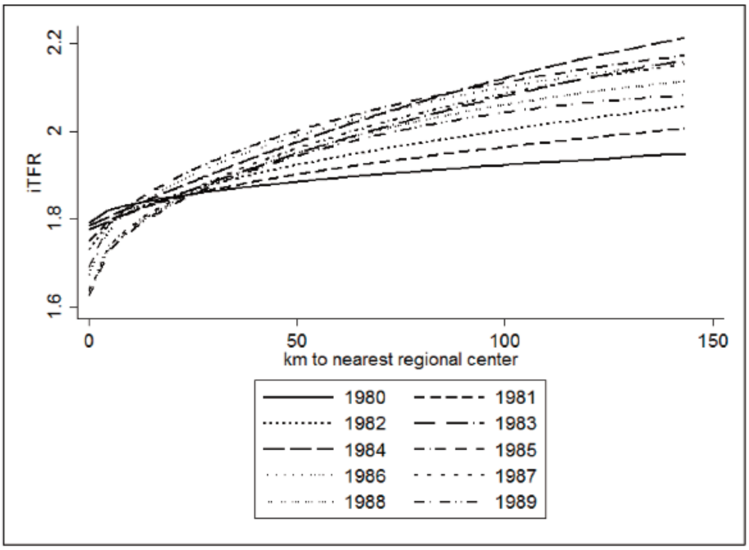


Figure 3. Associations between yearly municipal iTFR and the municipality's distance (in kilometers) to the nearest regional center, 1990–1999. The curves are attained from fractional polynomial regression models with the lowest deviance.

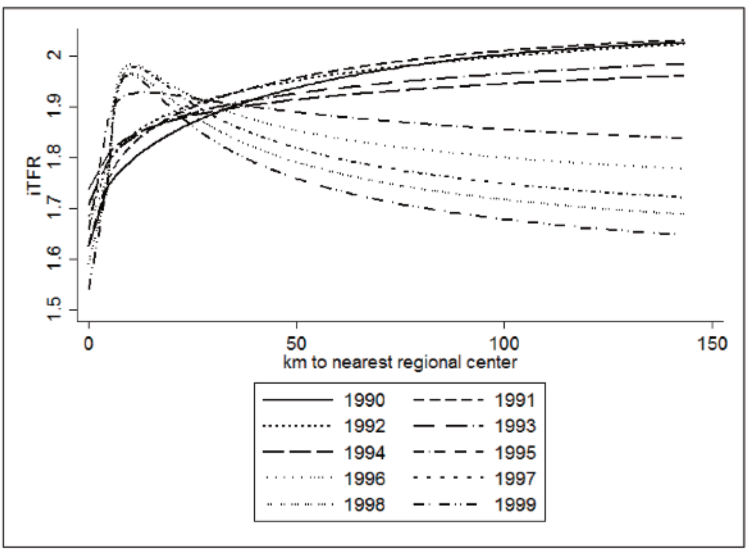


Figure 4. Associations between yearly municipal iTFR and the municipality's distance (in kilometers) to the nearest regional center, 2000–2009. The curves are attained from fractional polynomial regression models with the lowest deviance.

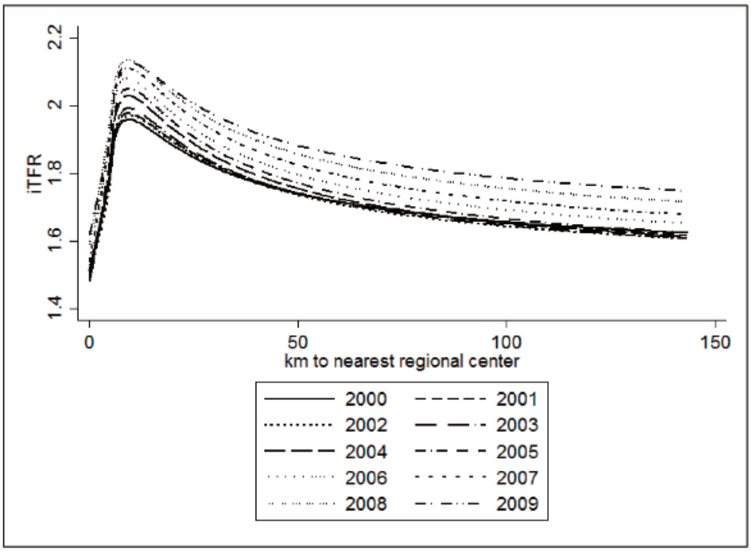
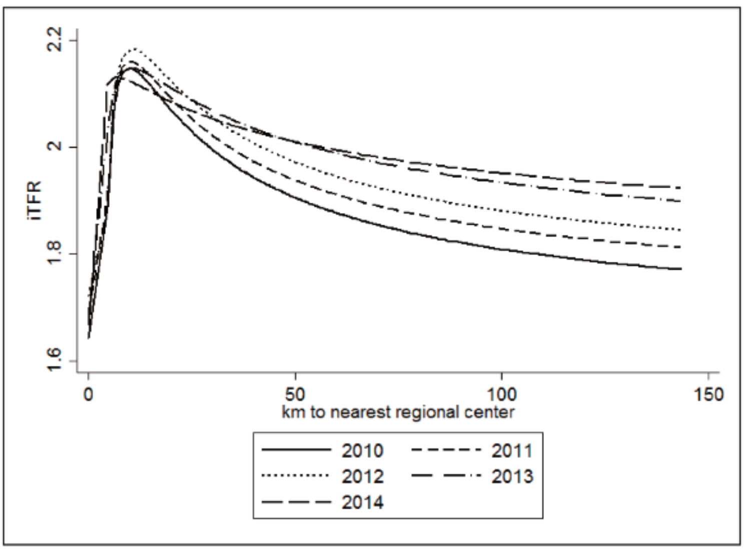


Figure 5. Associations between yearly municipal iTFR and the municipality's distance (in kilometers) to the nearest regional center, 2010–2014. The curves are attained from fractional polynomial regression models with the lowest deviance.



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