DEMOGRAPHIC RESEARCH

A peer-reviewed, open-access journal of population sciences

DEMOGRAPHIC RESEARCH

VOLUME 55, ARTICLE 15, PAGES 451–464
PUBLISHED 8 SEPTEMBER 2026
https://www.demographic-research.org/Volumes/Vol55/15/
DOI: 10.4054/DemRes.2026.55.15

Descriptive Finding

The role of childlessness in changes in cohort fertility: Cross-national comparisons of countries in Europe, East Asia, and North America

John Ermisch

Contents

Demographic Research: Volume 55, Article 15
Descriptive Finding

The role of childlessness in changes in cohort fertility: Cross-national comparisons of countries in Europe, East Asia, and North America

John Ermisch[1]

Abstract

BACKGROUND
Much attention has been paid recently to the large decline in period fertility in many countries since 2010. In the Nordic countries and England and Wales much of it can be attributed to the decline in first-birth rates, suggesting higher childlessness.

OBJECTIVE
The aim of this paper is to quantify the contribution of childlessness to changes in cohort completed fertility between the 1960 and 1979 cohorts, for sixteen countries from Europe, East Asia, and North America.

METHODS
Using Kitagawa exact decomposition, I decompose the changes in cohort completed fertility between two components: the proportion of women who remained childless up to the age of 45 ('nulliparous' women) and the average number of children born to women who became mothers by age 45 ('parous' women). The data primarily come from the Human Fertility Database.

RESULTS
The contribution of childlessness to the change in fertility of the 1960–1979 cohorts is varied. In many countries a rise in childlessness made a large contribution to the decline in their cohort fertility (e.g., Japan, South Korea, Spain, and Poland), but in others its contribution is small.

CONCLUSIONS
Increases in childlessness played a larger relative role in cohort fertility decline in countries which experienced large declines.

CONTRIBUTION
This paper decomposes the changes in cohort fertility into two components, using a simple exact decomposition and more-recent birth cohorts than in Zeman et al. (2018), and ascertains conditions where the childlessness component was large.

[1] Nuffield College, University of Oxford, Oxford, UK. Email: john.ermisch@sociology.ox.ac.uk.

1. Introduction

Since 2010 there has been a large decline in period fertility in many countries. In the Nordic countries and England and Wales much of it can be attributed to the decline in first-birth rates (Ermisch 2021; Hellstrand et al. 2021 and Ohlsson-Wijk and Andersson 2022), suggesting an increase in childlessness. For instance, Ermisch (2024: Table 2) indicates that for England and Wales the period first-birth progression ratio fell from 0.89 for 2010–2012 to 0.81 for 2013–2016 and 0.76 for 2017–2020. But, as is widely appreciated, this development may be attributable to changes in the timing of entry into motherhood, indicating that we should take a birth-cohort perspective to assess changes in (biological) childlessness.

The present paper aims to calculate the contribution of childlessness to changes in cohort completed fertility (CCF) between the 1960 and 1979 birth cohorts. It addresses similar issues to Zeman et al. (2018), who decompose the decline in CCF by parity in 32 low-fertility countries using parity progression ratios (PPR). They focus on changes between the 1940, 1955, and 1970 cohorts (see their Figure 4). Among women born between 1955 and 1970, a decline in second-birth rates played an important role in the decline in CCF in Central and Eastern Europe, while in the German-speaking countries, Southern Europe, and East Asia a rise in childlessness played the major role.

Lazzari, Mogi, and Canudas-Romo (2021) decompose CCF changes between the 1940–1945 and 1965–1970 cohorts by education and parity for eleven low fertility countries and find that the decline in third and higher order birth rates was central to the decline in CCF in the countries they studied, while the role of childlessness and second-birth rates varied substantially across countries. As many countries have experienced further declines in CCF or changes in childlessness since the 1970 cohort, an update to these two earlier studies is needed.

There are other studies of trends in CCF and childlessness: Jalovaara et al. (2019) for the Nordic countries, which considers both men (cohorts 1940–1967/69) and women (1940–1972/74), Kuang et al. (2024) for women in the United Kingdom countries (1956/59 to 1975/78), and Requena and Reher (2025) for Spanish men and women (1935/39 to 1970/74). However, these studies do not calculate the contribution of childlessness to changes in CCF.

The contribution of the present study is to employ an exact Kitagawa decomposition of changes in CCF since the 1960 cohort for 16 countries in Europe, East Asia, and North America into those attributable to a rise in childlessness and those due to a change in CCF among parous women. It uses information on more recent birth cohorts than the previous studies, namely those born up to 1979. The decomposition method does not require accurate information on the complete parity distribution but only on being childless compared with other parities, enabling us to address the research question.

The study finds considerable diversity among countries in the role played by childlessness in accounting for changes in their cohort fertility over cohorts 1960–1979. It finds that increases in childlessness played a much larger relative role in CCF decline in countries which experienced large declines.

2. Data and methods

2.1 Data

The data comes primarily from the Human Fertility Database (2025), although the study also draws on data from the statistical offices of some individual countries (e.g., ONS 2025) and from the Cohort Fertility and Education (CFE) database (https://www.eurrep.org/database/). To be included in the present study it was necessary for a country to report data on childlessness by individual birth year from 1960 to the late 1970s, which constitute a subset of countries reporting CCF in the Human Fertility Database (HFD). For example, France reports CCF but not childlessness. These data were supplemented by information on two other key low-fertility countries (South Korea and China) for which data for groups of birth years were available.

2.2 Methods

The decomposition method used was introduced by Geruso and Spears (2025). It makes the simple distinction between two components of CCF: (1) the proportion of women who remain childless up to age 45 ('nulliparous' women) and (2) the average number of children born to women who became mothers ('parous' women) by age 45. This allows an exact decomposition of changes in CCF into these two components, with the first indicating the contribution of childlessness. Their study focuses on an average contribution of childlessness to CCF change in 17 countries (from the HFD) over the last 20 birth cohorts available in each country, and finds that it accounts for about two-fifths of the CCF change. The present study is interested in the diversity of the contribution of childlessness.

The method can be implemented with published birth registration data which records whether a woman has previously had any children, or from population census or register-based information on parity distributions. Compared to the PPR decomposition, this two-component decomposition more easily accommodates detailed year-to-year birth cohort trends, is exact, and is likely to produce more precise estimates because it estimates fewer parameters. However, the compilers of the HFD warn that the indicators of cohort parity distribution should be used with caution. Although here we only use the proportion childless, its measurement may still be problematic for cohort measures reconstructed from period fertility rates (discussed by Zeman et al. 2018: 664), and because of fertility-related selective survival to age 45 (operating through both mortality and international emigration) for measures based on population censuses and registers.

The decomposition of CCF is based on the identity $\mathrm{CCF}_c \equiv p_c \mathrm{CCFP}_c$, where c indicates birth year and p_c is the proportion of that cohort that is parous. Using the exact decomposition suggested by Kitagawa (1955: 1176–1177), the change in CCF between any two cohorts A and B attributable to the change in childlessness (i.e., $1 - p_c$) is $(p_A - p_B)(0.5\mathrm{CCFP}_A + 0.5\mathrm{CCFP}_B)$. The remainder of the change in CCF is due to changes in CCFP between cohorts A and B: $(\mathrm{CCFP}_A - \mathrm{CCFP}_B)(0.5p_A + 0.5p_B)$.

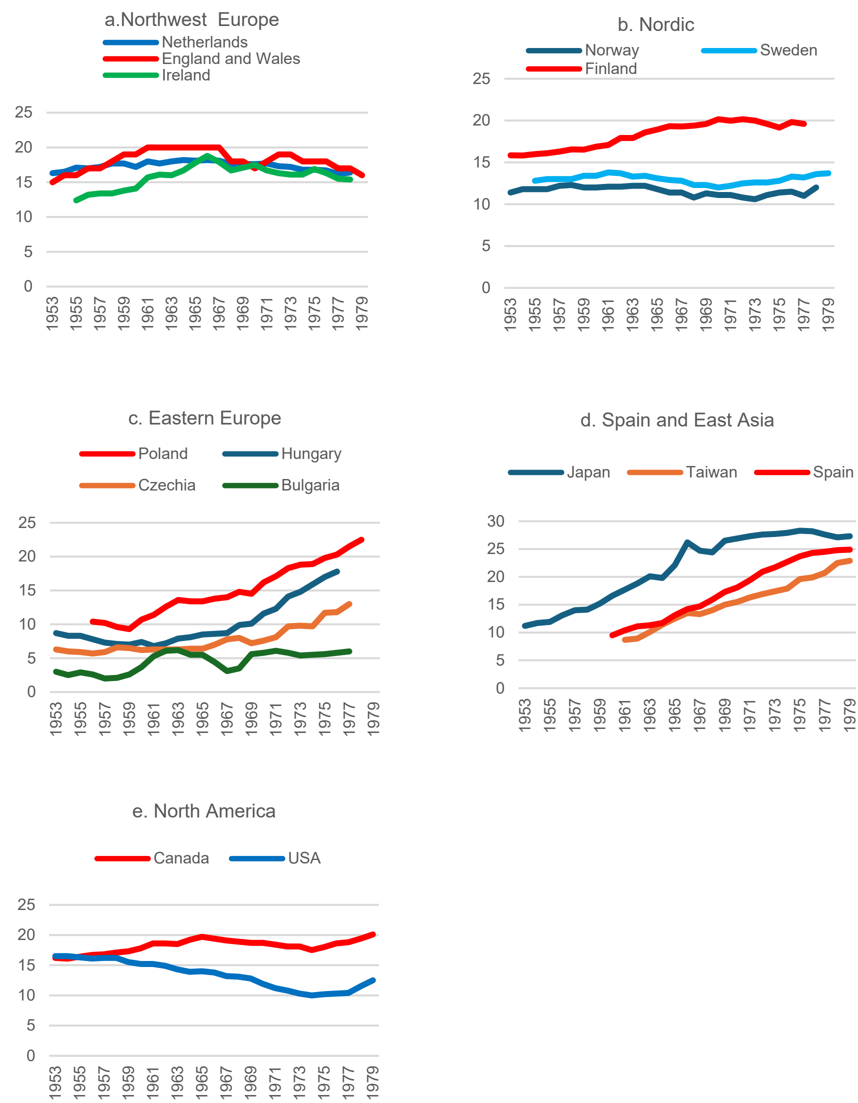
3. Trends in selected countries

Figures 1 and 2 compare the percentage of women who remain childless ($(1 - p_c)x100$) and CCFP, respectively, in fifteen countries in Europe, East Asia, and North America which have the requisite data. As the CCF fell after 1960 for all the selected countries other than the USA, a comparison of the 1960 and 1979 cohorts is meaningful.

Figure 1 shows large increases in childlessness in Japan, Taiwan, Spain, Finland Hungary, Czechia, and Poland, but relative stability in the other countries. French data are absent from Figures 1 and 2 because their registration system does not collect information about whether women previously had children. Köppen, Mazuy, and Toulemon (2017: 83–85) report that 11%–13% of all women born in 1960 in France remained childless. Information from the CEF database based on French surveys indicates that it rose to 14% for the 1961–1965 and 1966–1970 cohorts. An estimate of French childlessness for the 1978 cohort of about 15% is consistent with the projection for the 1980 cohort in Köppen, Mazuy, and Toulemon (2017: Figure 4.2). This estimate implies a CCFP which is virtually the same as for the 1960 cohort (2.41).

Figure 2 shows cohort completed fertility among parous women (CCFP) for these same countries. There was a rise in the USA, but there were reductions for cohorts born after 1960 in the other countries shown, with especially large declines in Ireland, Poland, Bulgaria, and Taiwan.

Figure 1: Percentage of cohort remaining childless by birth year in selected countries



Source: Human Fertility Database (2025).

Figure 2: Cohort completed fertility among parous women (CCFP) by birth year, calculation based on Human Fertility Database (2025): $\mathrm{CCFP}_c \equiv \frac{\mathrm{CCF}_c}{p_c}$

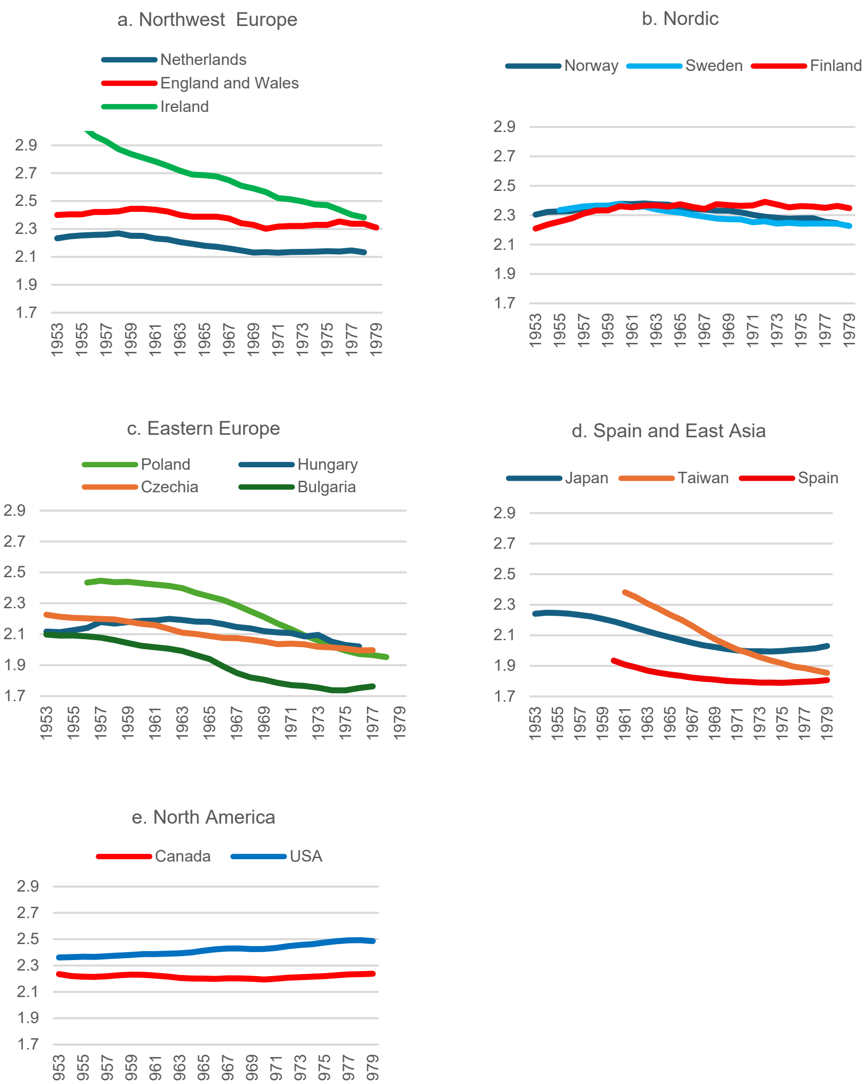
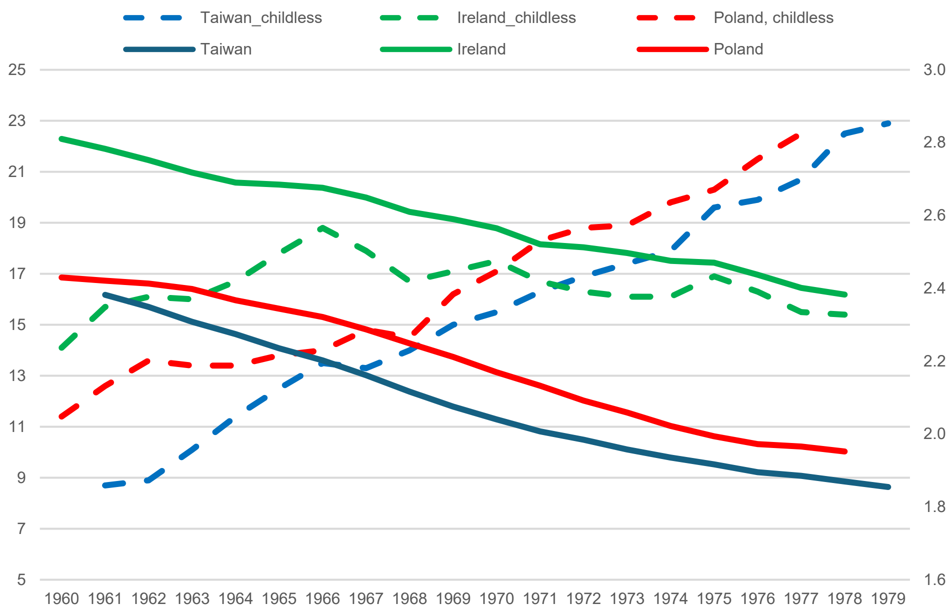


Figure 3 shows the percentage childless and CCFP for the three selected countries which experienced the largest declines in CCF after the 1960 cohort: Taiwan (–0.74 births per woman), Poland (–0.66), and Ireland (–0.40). Increases in childlessness made important contributions to the CCF declines in Taiwan and Poland and decreases in CCFP contributed substantially to the declines in all three countries.

Figure 3: Percentage childless (LH scale) and CCFP (RH scale) for Taiwan, Ireland, and Poland[a]



Note: [a] Taiwan 1961–1979; Poland 1960–1978; Ireland 1960–1978.
Source: Human Fertility Database (2025).

4. Results of decomposition analysis

The data were used to undertake exact decompositions for the change in CCF between the 1960 and 1979 cohorts (or the latest available in the late 1970s). These are shown in Table 1 for the countries in Figures 1 and 2 and France. First, CCF fell in all countries shown other than the USA. The declines were small for Canada and Northwest Europe other than Ireland, and the reductions for England and Wales, the Netherlands, and particularly Ireland were entirely or mainly (Ireland) accounted for by lower fertility among parous women (CCFP) rather than a rise in childlessness.

In the Nordic countries the fall in CCF was moderate, sometimes mainly accounted for by a rise in childlessness (Finland) and sometimes by a decline in CCFP. A rise in childlessness played a relatively large role in the Eastern European countries shown – other than Bulgaria, for which the decline in CCFP dominated.

Table 1: Decomposition of change in CCF between cohorts 1960 and 1979[a]

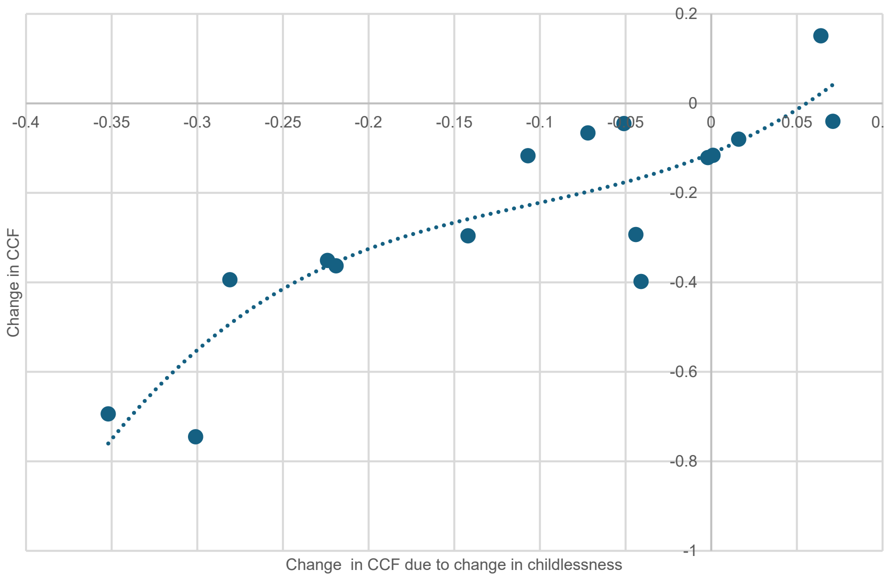
	Due to change in childlessness	Due to change in CCFP	Total Change in CCF	% childless component	Latest CCF	Latest proportion childless
NW Europe						
England and Wales	0.070	–0.110	–0.040	–178	1.94	0.160
France [b]	–0.072	0.006	–0.066	109	2.05	0.150
Netherlands [b]	0.016	–0.096	–0.080	–20	1.78	0.164
Ireland [b]	–0.041	–0.357	–0.398	10	2.02	0.154
Nordic						
Sweden	–0.006	–0.130	–0.136	2	1.92	0.137
Finland	–0.107	–0.010	–0.117	91	1.85	0.214
Norway [b]	0.001	–0.117	–0.116	–1	1.98	0.120
Eastern Europe						
Poland [b]	–0.256	–0.401	–0.657	51	1.51	0.225
Hungary [c]	–0.219	–0.144	–0.363	60	1.66	0.178
Czechia [d]	–0.138	–0.158	–0.296	48	1.74	0.130
Bulgaria [d]	–0.044	–0.249	–0.293	15	1.66	0.060
Southern Europe						
Spain	–0.281	–0.113	–0.394	71	1.36	0.249
East Asia						
Japan	–0.224	–0.127	–0.351	64	1.48	0.273
Taiwan	–0.294	–0.451	–0.745	40	1.43	0.229
North America						
USA	0.064	0.087	0.151	42	2.17	0.125
Canada	–0.051	0.006	–0.045	113	1.79	0.201
Weighted mean[e]	–0.053	–0.037	–0.089	35	1.90	0.170
without USA	*–0.142*	*–0.131*	*–0.273*	*31*	*1.69*	*0.205*
Simple mean	–0.105	–0.143	–0.248	32	1.77	0.173

Note: [a] Standardisation was done for yearly adjoining cohorts, and the annual decomposed changes were summed over the entire period. The exception is France, for which the standardisation averaged the endpoint years (1960 and 1978). The decompositions are not sensitive between these two methods of standardisation.
[b] Final year 1978
[c] Final year 1976
[d] Final year 1977
[e] Weighted by each country's female population aged 15–49 in 2022.

A rise in childlessness contributed three-fifths or more of the decline in CCF in Hungary, Spain, and Japan, all of which had a below-replacement CCF for the 1960 cohort and a large subsequent decline in CCF. In Taiwan, which had the largest CCF decline, the larger contribution was from the fall in CCFP but a rise in childlessness also contributed two-fifths. The importance of increasing childlessness for Spain and Japan is consistent with the results from the PPR decomposition for 1955–1970 in Zeman et al. (2018: Figure 5).

Figure 4 shows the relationship between the childlessness component in CCF change (horizontal axis) and total CCF change (vertical axis). Not surprisingly, the two series are strongly correlated (unweighted $\rho = 0.86$).

Figure 4: Relationship between total change in cohort completed fertility (CCF) (vertical axis) and the childlessness component of CCF change (horizontal axis)



Source: Table 1 plus cubic ‘trend line’.

In countries with large cohort fertility declines, a large relative contribution came from an increase in childlessness. Eight countries experienced a fall in CCF of 0.29 children per woman or more (weighted mean decline = 0.45 – all means were weighted by the country’s female population aged 15–49 in 2022). These countries are in Eastern Europe and East Asia, plus Ireland and Spain. On average, 58% (robust SE = 5%) of their decline was attributable to a rise in childlessness (unweighted mean = 45%, robust SE = 8%). In the remaining countries in Table1, the childlessness component contributed 26% (robust SE = 31%) of the CCF change (unweighted mean = 20%, robust SE = 34%).

Countries in East Asia other than Taiwan and Japan also had large fertility declines, but information about their CCF or childlessness is limited. South Korea's CCF declined from 1.95 to 1.50 between the 1961/65 and 1976/80 birth cohorts (Hwang 2023: Figure 1). Estimates of childlessness suggest that all the CCF decline was due to a rise in childlessness (from about 5% to 26%).

Data on completed fertility in China are patchy. Estimates from Yang, Jiang, and Sanchez-Barricarte (2022: Tables 5 and 6) indicate that CCF fell from 2.36 to 1.62 between women born 1951–1955 and those born 1966–1970. Yang, Jiang, and Sanchez-Barricarte (2022) estimate that only one-tenth of that 0.74 decline was attributable to an increase in childlessness from 1% and 4%. Although these percentages appear very low for a country with CCF = 1.62, Bulgaria (CCF = 1.66) also had only 6% childlessness. Large declines in Chinese period fertility in recent years suggest further declines in cohort fertility for those born since 1970. For example, the Chinese TFR reached 1.30 in 2015 (Yang, Jiang, and Sanchez-Barricarte 2022), and UN estimates indicate a TFR of 1.00 in 2023.

5. Discussion and conclusions

There is considerable diversity among countries in the role of childlessness in accounting for long-term changes in their cohort completed fertility over birth years 1960–1979. A rise in childlessness played a much larger relative role in cohort fertility decline in countries which experienced large declines. In the data analysed here, these were mainly countries in Eastern and Southern Europe and in East Asia.

The conclusion about the association between the relative role of childlessness and the size of the cohort fertility change is reinforced by examination of important historical periods of change in English and Welsh completed fertility (data from ONS 2025). A change in childlessness contributed a large proportion of the change in both the large rise in CCF between the 1920 and 1934 cohorts and the subsequent big decline between the 1934 and 1960 cohorts (three-fifths and two-fifths of the CCF-change, respectively).

The larger contribution of childlessness to large CCF changes is not purely mechanical. As Zeman et al. (2018: Figure 2) note, PPRs have many alternative paths to low cohort fertility. For example, Bulgaria and Czechia had low levels of childlessness for cohorts born in the late 1970s (0.06 and 0.13, respectively) despite their low CCF. Nevertheless, high childlessness was associated with low CCF: the weighted correlation between the last observed CCF and the proportion childless among the countries in Table 1 was –0.92 (robust SE = 0.12), with Bulgaria and Czechia being outliers. The unweighted correlation was –0.63 (robust SE = 0.14).

Levels of childlessness exceeding one-quarter of a cohort, such as those in Spain, Japan, and South Korea, are a phenomenon that has been experienced rarely, if at all, since the cohorts of the early 20th century in France (about 25% according to Onnen-Isemann 2003) and England and Wales (about 30% for the 1902–1906 cohort, taking into account that 20% of married women remained childless (UK Data Archive 2020) and 16.6% of women never married (ONS 2014)).

Why is childlessness so high in some countries? Norms for remaining childless can vary among countries, and different economic and policy contexts may alter goals for completed family size or their achievement. Trying to identify more precisely what affects completed fertility is difficult because it is the outcome of accumulated influences on women's fertility over their childbearing years. Cohort outcomes can be generated by varying uncertainty about the future and unexpected developments in people's lives. Many who postpone having children end up having a smaller number than they expected when they were in their early childbearing years, including remaining childless (Rybinska and Morgan 2019). For example, among the low-fertility countries of Taiwan, Singapore, Japan, and South Korea, a two-child norm characterised the family-size desires of the women in the cohorts born in the late 1970s who ended up with low CCF (Basten and Verropoulou 2015; Gietel-Basten 2018, 2019). Research also strongly suggests that childlessness was unintentional for a substantial proportion of English and Welsh women (Berrington 2021). For example, almost one-third of childless British women born in 1970 who at age 30 intended to have a child remained childless at age 42 (Berrington 2017). Remaining childless was often the outcome of uncertainty or unexpected events such as partnership breakup, which ended up postponing motherhood and resulted in childlessness because of declining fecundity with age.

The attributes of women who remain childless changed in some countries. For example, in the Nordic countries childlessness increased most among women with low education, so that they now have the highest rates of childlessness (Jalovaara and Miettinen 2025; Jalovaara et al. 2019).

But childlessness is not the whole story behind low completed fertility. It is noteworthy that completed fertility among parous women (CCFP) born in the late 1970s in Spain, Japan, Poland, Czechia, Bulgaria, and Taiwan was below the replacement level.

References

Basten, S. and Verropoulou, G. (2015). A re-interpretation of the 'two-child norm' in post-transitional demographic systems: Fertility intentions in Taiwan. *PLoS ONE* 10(8): e0135105. doi:10.1371/journal.pone.0135105.

Berrington, A. (2017). Childlessness in the UK. In: Kreyenfeld, M and Konietzka, D. (eds.). *Childlessness in Europe: Contexts, causes and consequences*. Cham: Springer: 57–76. doi:10.1007/978-3-319-44667-7_3.

Berrington, A. (2021). Fertility desires, intentions, and behaviour. In: Schneider, N.F. and Kreyenfeld, M. (eds.). *Research handbook on the sociology of the family.* Cheltenham: Edward Elgar: 248–262. doi:10.4337/9781788975544.00025.

Ermisch, J. (2021). English fertility heads south: Understanding the recent decline. *Demographic Research* 45(29): 903–916. doi:10.4054/DemRes.2021.45.29.

Ermisch, J. (2024). The recent decline in period fertility in England and Wales: Differences associated with family background and intergenerational educational mobility. *Population Studies 78*(2): 325–339. doi:10.1080/00324728.2023.2287510.

Geruso, M. and Spears, D. (2025). Childless or child fewer? Childlessness and parity progression where fertility is below replacement. Cambridge, MA: National Bureau of Economic Research. (NBER Working Paper 33913). doi:10.3386/w33913.

Gietel-Basten, S. (2018). Fertility preferences in Taiwan. In: Gietel-Basten, S., Casterline, J., and Choe, M. (eds.). *Family demography in Asia: A comparative analysis of fertility preferences*. Cheltenham: Edward Elgar: 109–120. doi:10.4337/9781785363559.

Gietel-Basten, S. (2019). *The "Population Problem" in Pacific Asia*. International Policy Exchange. Oxford: Oxford University Press.

Hellstrand, J., Nisén, J. Miranda, V., Fallesen, P., Dommermuth, L., and Myrskylä, M. (2021). Not just later, but fewer: Novel trends in cohort fertility in the Nordic countries. *Demography* 58(4): 1373–1399. doi:10.1215/00703370-9373618.

Human Fertility Database (2025). Rostock: Max Planck Institute for Demographic Research and Vienna: Vienna Institute of Demography. (www.humanfertility.org, data downloaded on 12 November 2025).

Hwang, J. (2023). Later, fewer, none? Recent trends in cohort fertility in South Korea. *Demography* 60(2): 563–582. doi:10.1215/00703370-10585316.

Jalovaara, M., Neyer, G., Andersson, G., Dahlberg, J., Dommermuth, L., Fallesen, P., and Lappegard, T. (2019). Education, gender, and cohort fertility in the Nordic countries. *European Journal of Population* 35: 563–586 doi:10.1007/s10680-018-9492-2.

Jalovaara, M. and Miettinen, A. (2025). Childlessness trends at different ages by educational attainment for men and women in Finland: A research note. *Population Studies* 80(2): 405–414. doi:10.1080/00324728.2025.2592578.

Kitagawa, E.M. (1955). Components of a difference between two rates. *Journal of the American Statistical Association* 50(272): 1168–1194. doi:10.2307/2281213.

Köppen, K., Mazuy, M., and Toulemon, L. (2017). Childlessness in France. In: Kreyenfeld, M. and Konietzka, D. (eds.). *Childlessness in Europe: Contexts, causes and consequences*: Cham: Springer: 71–95. doi:10.1007/978-3-319-44667-7_4.

Kuang, B., Berrington, A., Christison, S., and Kulu, H. (2024). Educational trends in cohort fertility by birth order: A comparison of England and Wales, Scotland, and Northern Ireland. *Demographic Research* 51(36): 1125–1166. doi:10.4054/DemRes.2024.51.36.

Lazzari, E., Mogi, R., and Canudas-Romo, V. (2021). Educational composition and parity contribution to completed cohort fertility change in low-fertility settings. *Population Studies* 75(2): 153–167. doi:10.1080/00324728.2021.1895291. Appendix at https://rmogi.shinyapps.io/CCF_Decomposition/.

Office of National Statistics (2014). Marriage statistics, cohabitation and cohort analyses. Dataset released 11 June 2014. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/marriagecohabitationandcivilpartnerships/datasets/marriagestatisticscohabitationandcohortanalyses.

Office of National Statistics (2025). Childbearing for women born in different years. Dataset released 2 April 2025. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/conceptionandfertilityrates/datasets/childbearingforwomenbornindifferentyearsreferencetable.

Ohlsson-Wijk, S. and Andersson, G. (2022). Disentangling the Swedish fertility decline of the 2010s. *Demographic Research* 47(17): 345–358. doi:10.4054/DemRes.2022.47.12.

Onnen-Isemann, C. (2003). Familienpolitik und Fertilitätsunterschiede in Europa: Frankreich und Deutschland. *Aus Politik und Zeitgeschichte Beilage zur Wochenzeitung Das Parlament B* 44(3): 31–38. [referenced in Köppen, Mazuy, and Toulemon (2017)]

Requena, M. and Reher, D.S. (2025). Cohort fertility differences between men and women in a developed population: Evidence from Spain. *Population Studies* 80(2): 239–256. doi:10.1080/00324728.2025.2573930.

Rybinska, A. and Morgan, S. P. (2019). Childless expectations and childlessness over the life course. *Social Forces* 97(4): 1571–1602. doi:10.1093/sf/soy098.

UK Data Archive (2020). Guide to SN 5754 – Selected tables relating to fertility from 1911, 1951 Censuses of England and Wales and 1946 Family Census. Colchester: University of Essex.

Yang, S., Jiang, Q., and Sanchez-Barricarte, J. (2022). China's fertility change: an analysis with multiple measures. *Population Health Metrics* 20(12). doi:10.1186/s12963-022-00290-7.

Zeman, K., Beaujouan, E., Brzozowska, Z., and Sobotka, T. (2018). Cohort fertility decline in low fertility countries: Decomposition using parity progression ratios. *Demographic Research* 38(25): 651–690. doi:10.4054/DemRes.2018.38.25.