Intergenerational transmission of fertility in the UK: A parity-specific investigation using the 1970 British Cohort Study

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Introduction

Intergenerational transmission, i.e., the transmission of behaviour from the older to the younger generation, is one of the main mechanisms through which the characteristics of the family of origin influence individuals' life chances. Such intergenerational continuities impact on individuals' economic and physical well-being, their life chances, and contribute to the accumulation of disadvantage across generations[1]. The intergenerational transmission of fertility is one of the most important such continuities across generations[1].

Previous studies have consistently shown that fertility behaviour is transmitted from mothers to daughters. However, it remains unclear whether socio-demographic or cultural factors are responsible for the transmission of fertility behaviour across generations. Most studies either focused on the transmission of parity (i.e., completed family size) or the transmission of fertility timing (i.e., age at first birth (AFB)) and very rarely did they analyse both. Additionally, most recent evidence comes from the Nordic countries of Sweden [2–4], Norway [5], and Denmark. Fewer studies are available for France, [6] and other European countries [1]. These studies found evidence of transmission of completed fertility persisting throughout the 20th century as well as strong links between first birth timing of successive generations, regardless of socioeconomic status. These findings suggest that socialisation and cultural factors play a more important role in shaping fertility behaviour across generations than socio-economic factors.

Limited evidence is available for the UK, a country with much higher levels of inequalities than the Nordic region and most European countries. These inequalities are not only visible when comparing the UK to other countries (e.g., the UK has one of the largest levels of income inequalities and poverty among European countries [7]) but there are also huge inequalities within the UK (e.g., between different regions [8]). This suggests that socio-economic factors are likely to play a more important role in the intergenerational transmission of fertility behaviour in the UK than in other countries. Previous studies in the UK context showed that a woman's origin family size is positively related to her own completed fertility[91], and there is some evidence of transmission of teenage pregnancy[10]. Additionally, the modelling strategy of previous studies (modelling the number of children women had) meant that the results may suffer from selection bias as they cannot account for selection into having children in the first place.

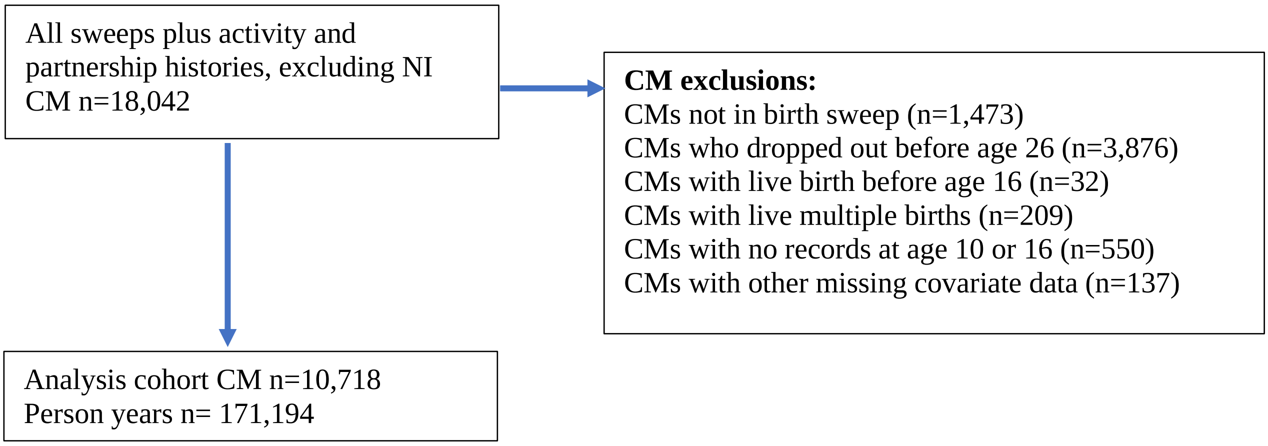
We fill these knowledge gaps by estimating parity-specific event history models to understand the role of economic and cultural factors in the intergenerational transmission of both fertility timing and quantum in the UK. We investigate the following research questions:

- What is the evidence for intergenerational transmission of fertility patterns in the UK at different parities, and how is this distributed across socio-economic groups?
- How does intergenerational fertility transmission relate to intergenerational patterns of social disadvantage?

Data and Methods

We use data from the 1970 British Cohort Study (BCS70) [11]. It follows 16,569 children born in England, Wales and Scotland in one week of 1970. After the first sweep at birth, cohort members (CM) were followed up at ages 5, 10, 16, 26, 30, 34, 38, 42 and 46. By age 30, 11,241 (68%) CMs remained in the study; this proportion was 48% by age 46 (N=7,940). Figure 1 shows the process for deriving the main analytical sample. After additionally excluding those with missing values on the covariates, the analytical sample consists of 10,718 CMs followed up until at least age 26 and with reasonably complete data on fertility in two generations. We estimated discrete-time event history models using logistic regression for risk of first, second and third birth using CM mother's parity and age at first birth (AFB) as the main predictor and adjusted for the family and CM characteristics and other covariates described below.

Figure 1: Creation of the analysis sample for event history analysis



Study outcome: CM fertility. CM fertility is measured using information on self-reported live births (discounting still births, abortions, and miscarriages). Live births and the year in which they occurred were primarily derived from CMs' comprehensive birth histories which were first collected at age 30, and then were followed up at age 34 and 38. Children born after 2008 were measured by reports of biological children in the household roster at sweeps 42 and 46. The fertility of CMs who dropped out between after age 26 (n=542, 3.2% of the cohort) was based on the total reported number of biological children at age 26.

Main independent variable: CM's mother's fertility (number of siblings). At the birth sweep, CM's mothers were asked for their complete pregnancy and birth history, which we used to derive the number of live births and their birth years up to and including the CM's birth. CM's mothers' AFB was categorised into age groups (<20, 20-24, 25-29, and 30+). The CM's younger siblings were detected from reports at age 5, 10 16 and 26 (information from the age 10 and 26 sweeps was based on co-residence in the household).

Other variables: CM characteristics. *Time constant characteristics* included gender, birth order (1, 2, 3, or 4+), region of birth, and languages spoken at home (English vs English plus another). For the analysis of transition to CM's second/higher order births, CM's age at first/second birth was included, in 5-year groups (<20, 20-24, 25-29, 30-34, 35+). *Time-varying characteristics* included age in 5-year groups (for transition for first birth) or duration since the previous birth (1, 2, 3-4 or 5+ years). Economic activity was classified as 'full-time education', 'work' or 'other' which included homemaker, maternity leave, unemployed and all other statuses. Partnership status, based on the collated partnership histories, was classified as 'not in a relationship', 'cohabiting' or 'married'. Educational level classified CMs as having low (O levels, CSEs or lower), medium (A levels, diploma, or vocational qualifications) or high level of education (degree, or a higher degree).

CM Family Characteristics *were all time-invariant*. We included mother's education based on school leaving age (Left before or at school leaving age (up to age 16) /Left school at 17 or over). To capture socio-economic status, we included social class at CM's birth based on father's/mother's occupation (whichever was the highest), regrouped as V unskilled, IV partly skilled, III manual, III non-manual, II Managerial and technical and I Professional. Parent's partnership status during the CM's childhood was derived from responses at age 5,10, and 16 on who the mother/father figures in the household were; this was grouped into continuously partnered, separated then repartnered (e.g. step-families), and single parent. We constructed a variable for intergenerational social mobility based on educational attainment in both generations.

Statistical Analysis. We used discrete-time event history analysis (EHA) [12]to estimate the risk of a first, second and third birth. This analysis treats the occurrence of an event as a binary outcome; 1 indicating the occurrence of an event and 0 indicating no event. We estimated three separate models: 1) transition to first birth, 2) transition to second birth, and 3) transition to third birth. Individuals are observed from age 16 until an event (i.e., first, second, or third birth) occurs or the CM is lost to follow-up, whichever happens first. Modelling parity-specific transitions rather than completed fertility allows us to use a larger sample and incorporate censored observations.

Results

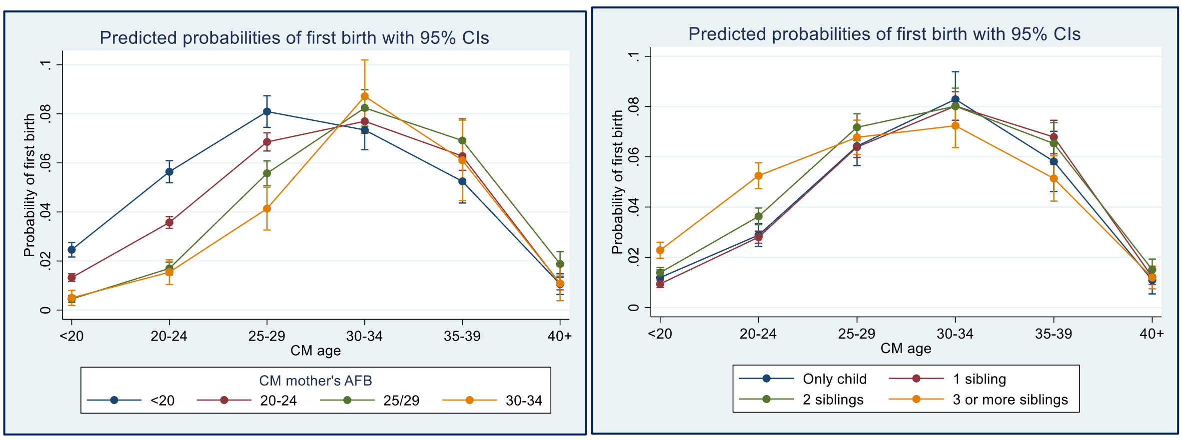
Table 1 shows fully adjusted logistic models for transitions to 1st, 2nd and 3rd birth, showing only the coefficients relating to maternal fertility. For transition to 1st birth, we find evidence for intergenerational transmission of number of children and age at first birth. When compared to CMs with 1 sibling, those with 2 or more siblings have a higher probability of having a first child. In other words, the higher the parity of the CM's mother, the more likely the CM is to have a first child, and at an earlier age. The likelihood of a birth at ages <25 was highest for those who have three or more siblings (Fig. 2b). Regarding the transmission of age at first birth, we found that if the mother was younger at the time of her first birth, the CM also made the transition to motherhood at a younger age than if the mother was older (Fig. 2a). Differences are only significant at younger ages indicating that it is mainly for CM's fertility timing before age 25 where mothers' age at first birth matters.

Table 1: Odds ratios (95% CIs) for logistic models for the odds of first, second and third births

		First birth	**Second birth**	**Third birth**
		OR (95% CI)	OR (95% CI)	OR (95% CI)
CM Total siblings (ref:1)	0 (only child)	0.99(0.90 - 1.08)	0.91(0.82 - 1.01)	1.18(0.98 - 1.41)
	2	1.12**(1.04 - 1.20)	0.97(0.89 - 1.06)	1.13(0.98 - 1.31)
	3+	1.22***(1.11 - 1.34)	1.06(0.94 - 1.18)	1.45***(1.21 - 1.73)
Mother's AFB (ref: 20-24)	<20	1.21***(1.14 - 1.29)	1.08*(1.00 - 1.16)	1.10(0.98 - 1.23)
	25-29	0.90**(0.84 - 0.96)	1.05(0.97 - 1.14)	0.94(0.81 - 1.09)
	30+	0.86*(0.76 - 0.97)	1.21*(1.04 - 1.40)	0.91(0.69 - 1.19)
Person-years		171,194	58,322	58,107
Sample size (men and women)		10,718	5,412	5,558

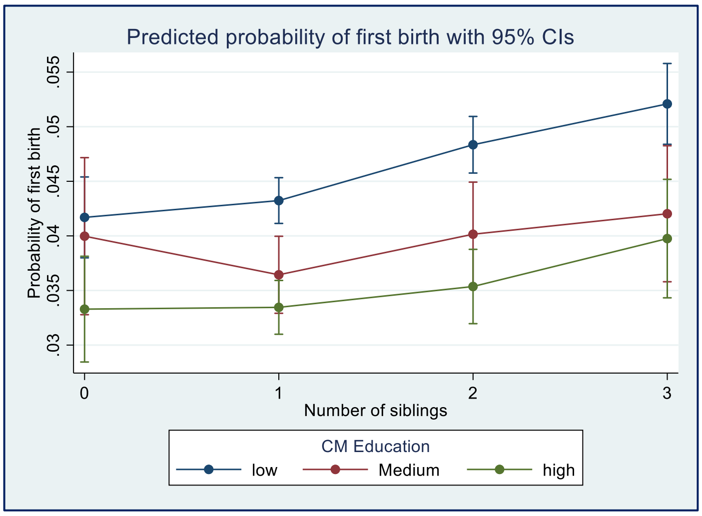
Notes: *p<0.05, **p<0.005 ***p<0.001. All models adjusted for CM gender, birth order, region of birth, language, time-varying activity status, partnership and education, mother's education, parental partnership history, social class at birth. First birth models adjusted for CM age, second and third birth models adjusted for duration since previous birth, and age at previous birth.

Figure 2a and 2b: Predicted probabilities of first birth according to mother's AFB and number of siblings



Overall, we found that the effect of mothers' parity was strongest for low educated CMs and the weakest for those with high level of education although not all differences were significant (Fig.3). Additionally, we found the effect to be stronger for women than men, especially if mothers had two or more children.

Figure 3: Predicted probabilities of first birth according to number of siblings and CM education



NB. All models adjusted for CM gender, birth order, region of birth, language, time-varying activity status, partnership and education, mother's education, parental partnership history, social class at birth.

The probability of a second birth is the highest among CMs with three or more siblings (Table 1), and lowest among only children. This is evidence for the intergenerational transmission of parity. Regarding age at first birth, CMs whose mother had their first child at a younger (<20) or older (30+) age are most likely to have a second child. Patterns persisted after adjustment for CM partnership, education and activity status. The probability of a third birth according to sibship shows a j-shaped relationship, being slightly elevated among only children, lowest among those with one sibling, and increasing with the number of siblings thereafter (Table 1). These patterns hardly changed after adjustment for other covariates. For second and third births, there were no interactions between sibship size and other covariates, suggesting the patterns persist across socio-economic strata. We also conducted a number of sensitivity analyses, repeating the modelling using sub-samples where there were no inconsistencies in birth reporting, and restricting to women only. Generally, the results are similar, albeit stronger among women only. We intend to check the results further using multiple imputation to deal with panel attrition.

Discussion

Using comprehensive birth history data from two generations in the UK, we find clear evidence for the intergenerational transmission of parity and age at first birth. Transition to first and third births are more likely if the CM had more siblings. Although we see few patterns for second births, this is in line with previous studies which have found fewer heterogeneities in second birth transitions in the UK [13]. This is the first study to conduct such comprehensive analyses in the UK. Our findings confirm the overall picture found from total cohort fertility comparisons [1], and are in line with those from Nordic countries [1,2].

We hypothesised that intergenerational transmission of fertility would be stronger in those from more disadvantaged backgrounds, or where there was lower intergenerational social mobility. We did observe some variation for transition to first birth indicating that SES and other characteristics are more important for whether women make the transition to parenthood at all. But otherwise, the intergenerational transmission of parity seems to be universal across socioeconomic groups and across intergenerational social mobility profiles. This indicates the important role of cultural and socialisation factors rather than SES for transition to a first and especially a third child. Future work could repeat the analysis on different cohorts to understand if intergenerational transmission is changing over time.

This study also demonstrates the strength of the 1970 British Cohort Study for studying fertility and life course processes[14], which has the advantage over other UK sources of having detailed parity and timing-specific fertility data from multiple generations prospectively collected, and a rich set of time-varying covariates. Although fertility is self-reported, comparisons to cohort fertility levels reported by the Office for National Statistics (ONS)[15] to our analysis sample suggest they are comparable when using a study design that accounts for censoring. We plan to conduct additional sensitivity checks, repeating the analysis using multiple imputed data to account for cohort attrition, and explore intergenerational transmission of other family processes.

References

1. Murphy, M. Cross-national patterns of intergenerational continuities in childbearing in developed countries. *Biodemography Soc. Biol.* **59**, 101–126 (2013).
2. Kolk, M. Multigenerational transmission of family size in contemporary Sweden. *Popul. Stud. (NY).* **68**, 111–129 (2014).
3. Kolk, M., Cownden, D. & Enquist, M. Correlations in fertility across generations: Can low fertility persist? *Proc. R. Soc. B Biol. Sci.* **281**, (2014).
4. Kolk, M. Understanding transmission of fertility across multiple generations - Socialization or socioeconomics? *Res. Soc. Stratif. Mobil.* **35**, 89–103 (2014).
5. Cools, S. & Hart, R. K. The Effect of Childhood Family Size on Fertility in Adulthood: New Evidence From IV Estimation. *Demography* doi:10.1007/s13524-016-0537-z.
6. Beaujouan, E. & Solaz, A. Is the Family Size of Parents and Children Still Related? Revisiting the Cross-Generational Relationship Over the Last Century. *Demography* **56**, 595–619 (2019).
7. Dorling, D. Income inequality in the UK: Comparisons with five large Western European countries and the USA. *Appl. Geogr.* **61**, 24–34 (2015).
8. McCann, P. Perceptions of regional inequality and the geography of discontent: insights from the UK. *Reg. Stud.* **54**, 256–267 (2020).
9. Booth, A. L. & Kee, H. J. Intergenerational transmission of fertility patterns. *Oxf. Bull. Econ. Stat.* **71**, 183–208 (2009).
10. Kneale, D., Fletcher, A., Wiggins, R. & Bonell, C. Distribution and determinants of risk of teenage motherhood in three british longitudinal studies: Implications for targeted prevention interventions. *J. Epidemiol. Community Health* **67**, 48–55 (2013).
11. Elliott, J. & Shepherd, P. Cohort profile: 1970 British Birth Cohort (BCS70). *Int. J. Epidemiol.* **35**, 836–843 (2006).
12. Allison, P. D. Discrete-Time Methods for the Analysis of Event Histories. *Sociol. Methodol.* **13**, 61 (1982).
13. Fiori, F., Graham, E. & Feng, Z. Geographical variations in fertility and transition to second and third birth in Britain. *Adv. Life Course Res.* **21**, 149–167 (2014).
14. Villadsen, A., Goodman, A., Berrington, A. & Kneale, D. The contribution of the 1958 and 1970 British birth cohort studies to lifecourse research on family transitions. in *Handbook on Demographic Change and the Lifecourse* (eds. Falkingham, J., Evandrou, M. & Vlachantoni, A.) 82–104 (Edward E lgar, 2020).
15. Office For National Statistics. *Childbearing for women born in different years*. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/conceptionandfertilityrates/bulletins/childbearingforwomenbornindifferentyearsenglandandwales/2018 (2019).