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The End of a European Exception: The First Signs of a Durable Decline in French Fertility?

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Introduction

For decades, France has represented an exception in the context of European fertility with regard to its comparatively high level of fertility, both in terms of period (total fertility rate, hereafter TFR) and cohort (completed cohort fertility, hereafter CFR) measures. The French exception of a CFR close to replacement level (2.00 children per woman for those born in 1969) is due to two factors: low levels of childlessness (high progression to first birth, PPR01 ≈ 0.85) and especially a high proportion of families with 3 children or more (PPR23 ≈ 0.40) (Breton and Prioux, 2005, 2009; Frejka and Sobotka, 2008; Toulemon et al., 2008; Beaujouan et al., 2017). With reference to the theoretical models proposed by Zeman et al. (2018), the French model could be characterised as “not stopping at two”.

However, the TFR in France has decreased continuously since a peak of 2.03 children per woman in 2010, and rapidly since 2014, to reach 1.84 children per woman[1] in 2020 (Papon and Beaumel, 2021). France is not the only European country with ‘high fertility’ (those having

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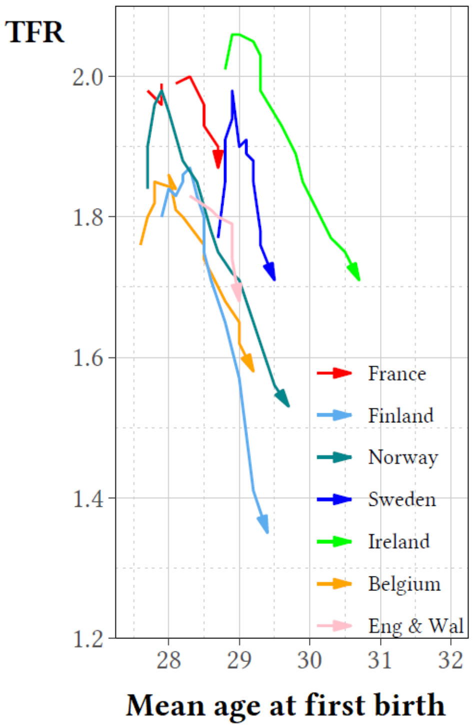
[1] Less than 1.8 children per woman in metropolitan France.

recently had a TFR greater than 1.8 children per woman[2]) to experience a recent decline. In these countries, rising age at first birth has been accompanied by a fall in TFR since 2009/2010 to such an extent that, today, France is the sole country with a TFR above 1.8 children per woman.

In the higher fertility countries most advanced along this process of a reversal in TFR – Belgium, Ireland, and the Scandinavian countries –, TFR has fallen by at least 0.2 children per woman in under a decade, and by almost 0.4 children in Finland. In other terms, fertility has decreased in these countries by between 0.2 (Belgium, Ireland) and 0.5 children per woman (Sweden) per year of postponement of first birth.

Figure 1. Trends in TFR and mean age at first birth – "high fertility" European countries, 2005-2019



Sources: Insee, Eurostat.

[2] These countries are France, Finland, Norway, Sweden, Ireland, Belgium, and England and Wales.

Until now, first birth postponement in France – and other Northwestern European countries with 'high' fertility – has led to a slight decrease in cohort fertility (Beaujouan and Toulemon, 2021). But what of the future? Will France follow the lead of Nordic countries where falling period fertility is expected to lead to "all-time low" levels of cohort fertility (Hellstrand et al., 2021)?

We aim in this paper to understand the recent decline in French fertility by focusing upon the two specific characteristics emblematic of the sustained intensity of fertility observed in France – the high progressions to both first and third births. Our analysis proceeds in the following manner. Firstly, annual parity progression ratios are calculated for the period 2004-2017 to observe their evolution over the period of recent period fertility decline. Secondly, we observe across birth cohorts the proportion of women having entered into motherhood at various ages, by level of education. Thirdly, for recent cohorts of parity 1, we examine the link between age at first birth and progression to subsequent births. Finally, we use a simple projection of completed cohort fertility within cohorts of parity 1 to illustrate possible trends in French cohort fertility.

Data and methods

French birth registration data has several well-known flaws. Importantly, data upon birth order is of poor quality (Toulemon and Mazuy, 2001; Breton and Prioux, 2009) and, as is the case in many countries, little socioeconomic information is collected upon the mother of the child. Notably, the mother's level of education is absent from birth registration data. For these reasons, differential analysis of fertility by parity and/or educational attainment is impossible using birth registration data. To answer our research questions, we thus use an alternative data source: the Insee Permanent Demographic Sample (EDP).

The EDP follows a sample of the French population by linking census, vital registration and administrative data. Originally a 1% sample of residents in metropolitan France (Couet, 2006), the EDP has grown since the middle of the 2000s to include four times as many individuals (Robert-Bobée and Gualbert, 2021) and include residents of overseas *départements* (Insee, 2019). Individuals are selected by birthdate and enter the sample at birth, or for immigrants, upon census enumeration or the registration of a vital event. Individuals exit the sample upon death or emigration (Couet, 2006)[3].

Analysis of fertility using the EDP is restricted to fertility occurring in metropolitan France for a 0.5% sample of residents (Robert-Bobée, 2006). Births to EDP members are recorded from 1968 onwards, and are observed until 2017 inclusive in the most recent database. The EDP is known to underestimate both period and cohort fertility measures[4], although trends are consistent with other sources, thus allowing to study changes over time (Robert-Bobée, 2006).

Our study population is composed of women from the generations who reached the age of 15 years old – the debut of their reproductive lives – from 1968 onwards, i.e. women born between 1953 and 2002. For the children of these women, birth order was attained by ordering an individual's matched birth registration entries by the date of birth of the children – the earliest corresponds to a birth of order one, the second to a birth order of two, etc. Prior to

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[3] The latter form of exit is unobserved. The non-exhaustiveness of the French census creates a near impossibility of determining exposure to events such as births as individuals may be unobserved due to having emigrated or not being enumerated at different censuses.

[4] This underestimation is constant over birth cohorts at around 10% for all women residing in France / 7% for women born in metropolitan France (Robert-Bobée, 2006: p. 19, table 2).

analysis a handful of women were removed from the study population due to the incompleteness of their birth histories (children's dates of births not fully recorded).

All studied women were enumerated at an annual census survey (EAR) in metropolitan France between 2013 and 2017 inclusive, and are thus representative of the female population on January 1st 2015[5]. Subsequently, all survived until the end of 2017, the final year of the observed period. Furthermore, these matched census records were used to obtain information upon the level of education of the studied women. Based upon their highest obtained diploma, women were grouped into two categories of education attainment – low/medium and high – with the latter corresponding to the attainment of a higher education diploma. To allow for the completion of a university degree, analysis using education was restricted to women whose level of education was collected at age 25 years old or over.

Results

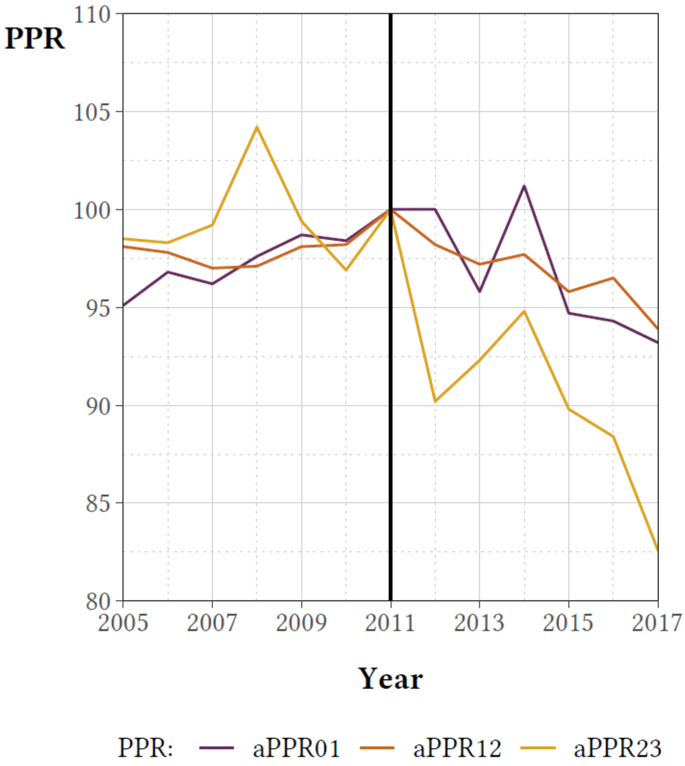
A reduction in all annual parity progression ratios.

The decline in fertility since 2011, and at an even faster rate since 2014, is observed across all annual parity progression ratios (Figure 2), with the most significant decline observed in progression to third births. The latter decline, having already started prior to the 2011 downturn in TFR, has seen progression to a third birth (aPPR23) fall by 17% since 2011 (0.341 in 2017 versus 0.413 in 2011). Entry into motherhood, represented by parity progression to first birth (aPPR01) is comparatively 7 percentage points lower in 2017 than in 2011 (0.804

[5] Weights based upon Insee's published population by age and sex on January 1st 2015 were calculated and applied to adjust for under-representation of certain generations. The median weight is 1.019, ranging from a minimum of 0.834 to a maximum of 1.315.

versus 0.863), whilst progression to a second birth (aPPR12) is down 6 points (0.755 compared to 0.804).

Figure 2. Evolution of annual parity progression ratios, 2004-2017 (Base 100 = 2011)



Source: Authors' calculations on EDP data.

As completed cohort fertility (CFR) is a function of the product of parity progression ratios, given the relationship

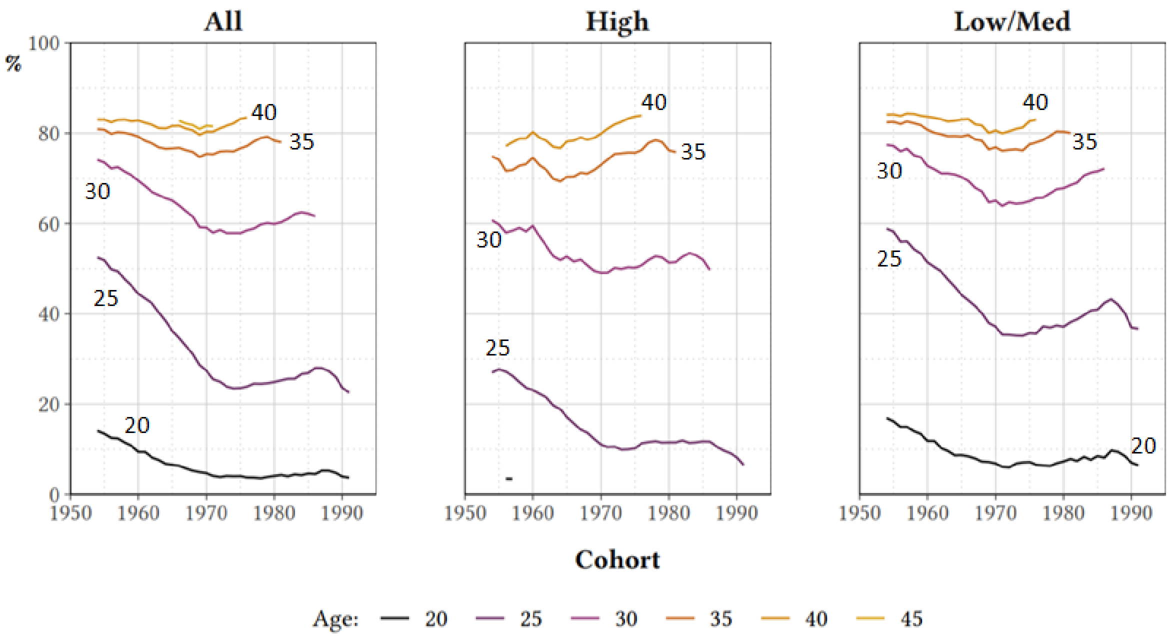
$$CFR = cPPR01 + cPPR01*cPPR02 + cPPR01*cPPR12*cPPR23 + \dots ,$$

the decreases in progression to second and third births are potentially the first signs of a durable decline in French fertility and a change in family structures with a fall in the proportion of large families (3 children or more). Not only are women with two children less likely to have a further child, but the proportion of women having two children, and thus potentially susceptible to have a third child, will decrease. But how do we interpret the decline in aPPR01 which could signify either a rise in childlessness among the younger generations, or an artefact of a "renewed" postponement of entry into motherhood?

The "renewed" postponement of entry into motherhood is also seen amongst low and moderately educated women.

Concerning the entry into motherhood, we observe a decrease in the proportion of women having a first child before their 25th birthday among the most recent generations. For women born from 1974 (thus reaching age 25 in 1999) until 1987 (aged 25 in 2012), the proportion of women having had a first child before their 25th birthday increased from 23.5% to 28.0%. Among women in the following birth cohorts, reaching the age of 25 years old after 2011, this proportion has fallen rapidly – on average by more than 1% over consecutive cohorts – to 22.5% of women born in 1991. This trend is observed for both women with high and low/medium educational attainment. For low and moderately educated women for whom an earlier entry into motherhood is more common, an entry into motherhood before age 25 years old occurred for one third (36.7%) of women with low and medium educational attainment born in 1991, compared to more than four in ten (43.2%) for those born in 1987. Whilst starting from a lower level, the decline in highly educated women entering into motherhood before age 25 is declining at a similar rate amongst the most recent cohorts after a sustained period of stability. A 5% decrease has occurred between the birth cohorts of 1986 and 1991, with the proportion of highly educated women already having had a child by age 25 decreasing from 11.7 to 6.5%.

Figure 3. Cumulative proportion of women having had at least one child by various ages, by birth cohort and education level



Source: Authors' calculations on EDP data.

Note: Moving averages across three birth cohorts. Certain values have been suppressed due to confidentiality requirements (e.g. proportions of highly educated women having at least one child at age 20).

This renewed postponement of entry into motherhood is the driver of the recent decrease in annual parity progression to first birth, as well as falling fertility rates for women younger than 25 years old (Breton et al., 2018), the majority of which is composed of first order births. If in France definitive childlessness varies little by educational attainment (Davie and Mazuy, 2010), completed fertility and fertility schedule varies widely, as in other European countries (Wood et al., 2014; Beaujouan et al., 2016). These recent developments may indicate the beginning of a lessening of the gap between the fertility behaviours of lower educated women towards those of their higher educated counterparts, who count today for almost half of women.

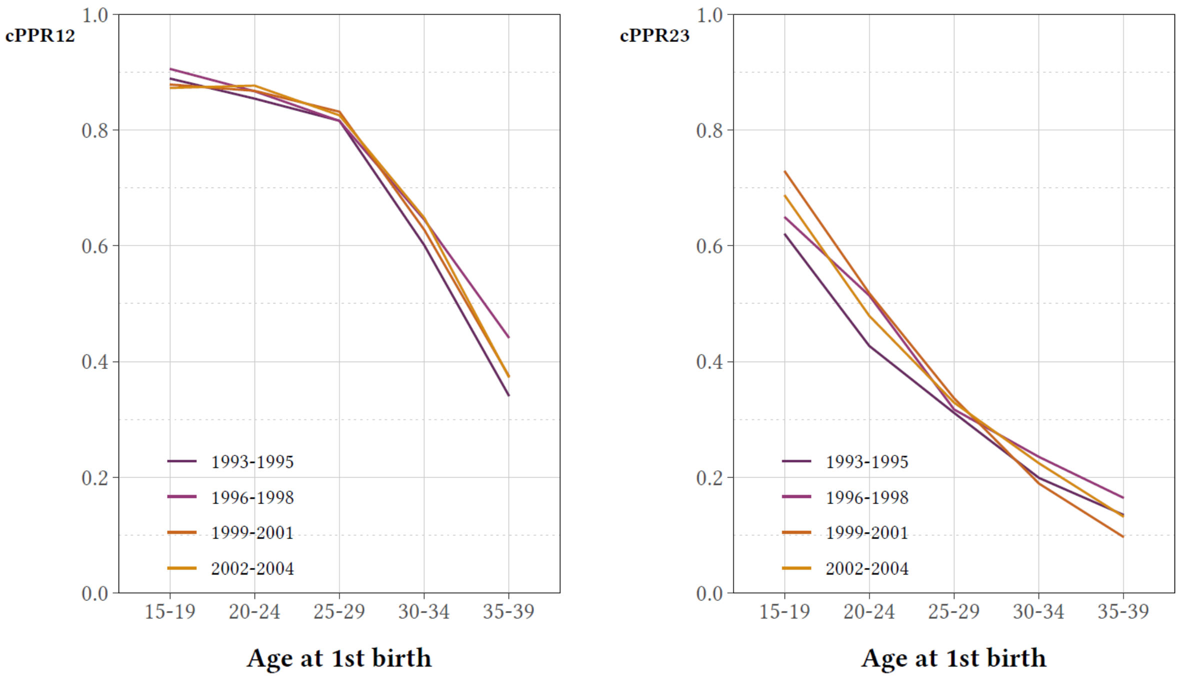
Progression to third birth is a function of age at first birth.

We have observed how, calculated annually, progression to third birth has decreased over recent years. However, calculating age-specific parity progression[6] within cohorts of parity (cPPR) reveals a relatively stable picture (Figure 4). Little change in progression to both second and third births over cohorts having experienced their previous births during the periods from 1993-1995 to 2002-2004 is observed. At older ages at first birth (30+), cPPR12 and cPPR23 fluctuates across cohorts of parity 1, with overall small increases[7]. In addition, cohort parity progression ratios vary little across education levels all other things being equal.

[6] Parity progression ratio calculated at time *t+13* years since first birth.

[7] Least squares linear regression reveals an increase of 0.012 in cPPR12 and 0.003 in cPPR23 between cohorts of parity 1 for women having entered motherhood aged 30-34 ; with an increase of 0.003 in cPPR12 and a decrease of 0.008 in cPPR23 for those having had their first child aged 35-39.

Figure 4. Progression to second (left panel) and third (right panel) births by age at first birth among cohorts of parity 1

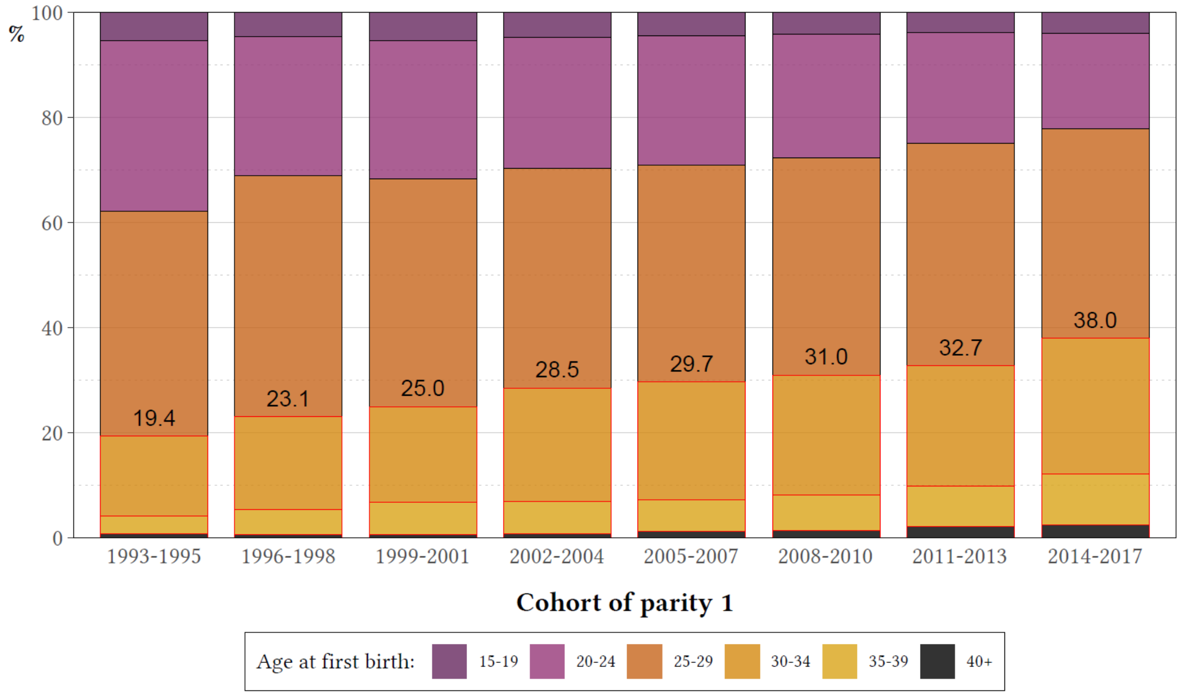


Source: Authors' calculations on EDP data.

What then is causing annual progression to third birth to decrease? Within cohorts of parity, progression to third and second births are a function of age at first birth. This latter relationship seems to be linked to a "critical" age at entry into motherhood of 30 years old. For mothers having had their first child before the age of 30 years old, only very slight differences in progression to a second birth are observed: cPPR12 varying from 0.89 for first-time mothers aged 15-19 years old to 0.82 for those having entered motherhood aged 25-29 years old. For mothers aged 30 years or older at first birth, progression to a second birth decreases linearly and rapidly with age at first birth, averaging 0.63 across the 1993-2004 cohorts of parity 1 for those aged 30-34 years old at first birth and 0.38 for those aged 35-39 years old.

If age-specific parity progression ratios across recent cohorts of parity 1 are relatively stable, the distribution of age at first birth is changing due to the continue postponement of first births. More and more women are delaying childbearing until their thirties (Figure 5): the proportion of first-time mothers aged 30 years or older has doubled from 19.4% in 1993-1995 to 38.0% in 2014-2017, this latter cohort presenting a marked increase from the previous. Older first-time mothers experiencing a less frequent progression to second, and especially, third births, has the effect of reducing both the intensity and overall contribution of higher order fertility – not only will fewer women be at risk of having a third child (due to fewer second births), but also fewer will progress to a third birth. It is thus likely that falling annual parity progression to third birth (aPPR23) is a result of the changing structure of age at first birth.

Figure 5. Distribution of age at first birth among recent cohorts of parity 1



Source: Authors' calculations on EDP data.

Hypothesised future decline in completed fertility

We argue that the continued compositional change in age at first birth will lead to a durable decline in French fertility. As an illustration, we propose four simple scenarios[8] of the future evolution of completed fertility amongst cohorts of parity 1 for whom their distribution of age at first birth has been observed (cohorts of parity 1 1993-1995 to 2014-2017).

Figure 6 shows the results of these scenarios. The first scenario (top-left panel) where both childlessness and age-specific parity progression ratios remain constant over cohorts indicates that in such conditions the completed fertility of the 2014-2017 cohort of parity 1 would be 6.6% lower than the 1993-1995 cohort[9]. This decrease is down purely to the mechanical effect of continued postponement leading to proportionally more first-time mothers aged 30 and above, who then subsequently have fewer children (progressing less to subsequent births) than younger first-time mothers.

A second scenario (top-right) could be viewed as what would need to occur in order for completed fertility to remain constant at a "high" level. In this scenario, childlessness remains constant and age-specific parity progression ratios follow trends observed over the 1993-1995 to 2002-2004 cohorts of parity 1, that is to say slightly increase for women having had their first child aged 25-34 years old who make up the bulk of the following cohorts. This scenario results in a relatively constant level of completed cohort fertility before a 0.9% decrease in the 2014-2017 cohort.

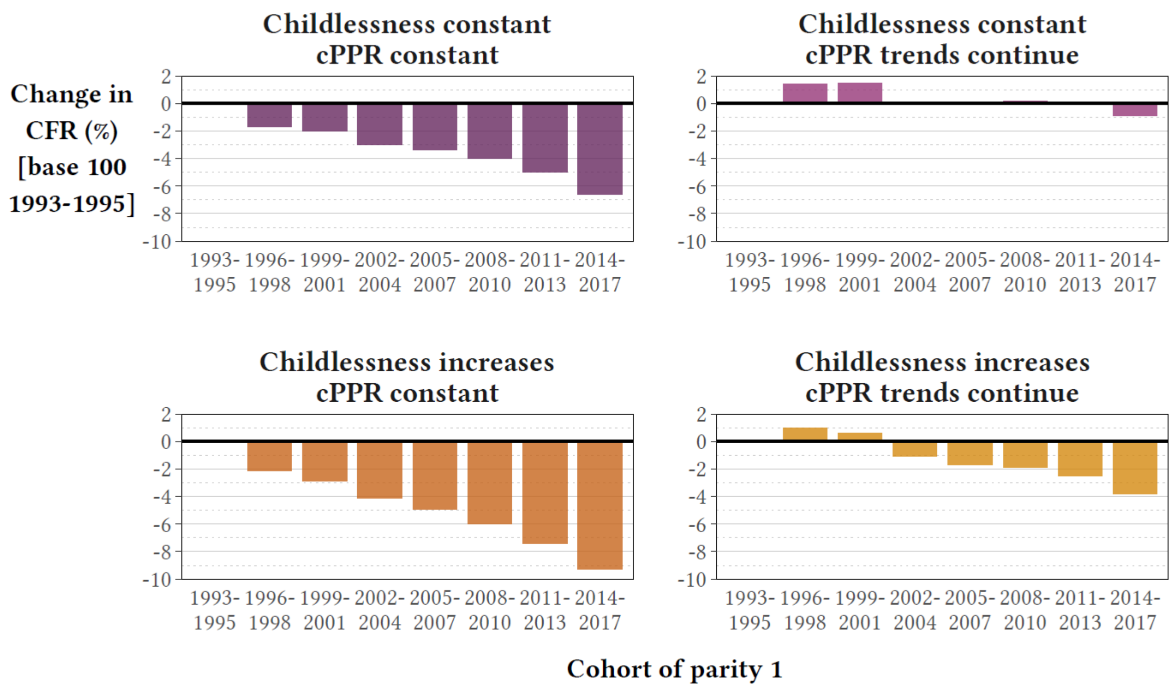
[8] See Appendix for methodology.

[9] We favour a relative rather than absolute measure of completed cohort fertility due to the underestimation of fertility levels by EDP data. For indication purposes, this is equivalent to a decrease from 1.86 to 1.74 children per woman.

However, childlessness in France is increasing over birth cohorts (Cohort Fertility and Education Database). When accounting for increasing childlessness and holding age-specific parity progression ratios stable (bottom-left), the decline in completed fertility would be even more dramatic, decreasing by 9.3% over the projected cohorts.

A final scenario (bottom-right), combining continuing trends in childlessness and age-specific parity progression ratios, would result in a relative decrease in completed fertility of 3.8% for the 2014-2017 cohort of first-time mothers compared to their 1993-1995 counterparts. To put this decrease into context, it is the equivalent of passing from a completed fertility of 2.0 children per woman to 1.92, in just a little over two decades. We note equally, the increasing pace of the projected decrease in completed fertility over cohorts – or, more specifically, as the proportion of older first-time mothers increases at a faster rate.

Figure 6. Projected completed cohort fertility (base 100: cohort of women entering into motherhood in 1993-95) among recent cohorts of parity 1



Source: Authors' calculations on EDP data.

Discussion

In the short-term, the decline in French fertility will continue in 2021 and probably into 2022 due to the effect of the COVID-19 pandemic. However, in our opinion, this only serves to amplify a deeper underlying trend of declining fertility. If the 'high and stable' French fertility has been driven and sustained by low childlessness (high PPR01) and high progression to third births (PPR23), changing distribution of age at first birth due to continued postponement is likely to lead completed fertility to fall, distancing itself from near replacement level. In addition, contextual effects such as changing values with regards to parenthood (more pronounced expression of voluntary childlessness intentions) and concerns over family, population and ecology, may lead to the continuation of growing childlessness. Also, with regard to higher order births and large families, a switch in France's family policies during the last decade from universal allocations dependant upon the parity of the child, to a means tested approach, may further influence the decision of parents to have subsequent children.

Appendix

Here we detail the methodology used to create the four scenarios of future completed fertility.

Projecting trends in childlessness

Firstly, observed childlessness in France from the CFE database was used to extrapolate levels of childlessness for birth cohorts yet to finish their reproductive lives. This corresponds to an increase in the proportion of childless women of 0.0012 per birth cohort. A translation from cohort of parity 1 to approximate corresponding birth cohorts was applied by subtracting the mean age at first birth for the women of the cohort of parity 1 by the years of first birth: e.g. for women having had their first child in 1993-1995, their mean age at first birth was 26.6 years old thus translating to approximate birth cohorts of 1993-26.6 ≈ 1966 to 1995-26.6 ≈ 1968. The average of the extrapolated proportion of childless women was then taken for these birth cohorts: (0.861+0.860+0.858 / 3) ≈ 0.860. The same process was used to project childlessness for the following cohorts of parity 1.

For scenarios where childlessness increases, values from Annexe figure A were used to project completed fertility whereas in constant childlessness scenarios, the value for the 1993-1995 cohort of parity 1 (=0.860) was applied to each cohort.

Appendix figure A. Projected levels of childlessness for each cohort of parity 1.

Cohort of parity 1	1993-1995	1996-1998	1999-2001	2002-2004	2005-2007	2008-2010	2011-2013	2014-2017
Mean age at first birth	26.6	27.2	27.3	27.6	27.7	27.9	28.3	28.8
Approximate corresponding birth cohorts	1966-1968	1969-1971	1972-1974	1974-1976	1977-1979	1980-1982	1983-1985	1985-1988
Proportion childless	0.860	0.856	0.852	0.850	0.846	0.842	0.838	0.835

Projecting trends in age-specific parity progression

For the constant cPPR scenarios, the average age-specific parity progression ratios observed after t+13 years since first birth for first-time mothers having entered into motherhood during the period 1993-2004 were used. For first time mothers aged 40 and above, where too few cases existed to observe, we arbitrarily set cPPR12 to 0.1 and subsequent parity progression ratios to zero.

For the scenarios based upon an increase in age-specific cPPRs across cohorts of parity 1, least squares linear regression was used on the 1993-1995 to 2002-2004 observed cPPRs to obtain the slope of the observed trends. These are given in Appendix figure B. As individual cohort of parity 1 age-specific cPPR34 observations were based upon few data points, age-specific cPPR34s were projected by multiplying cPPR23 by a fixed coefficient. This coefficient was obtained by the average ratio of cPPR34 to cPPR23 for each age at first birth for all women having had a first child during the period 1993-2004.

Appendix figure B. Changes in age-specific parity progression over consecutive cohorts of parity 1.

Age at first birth	Increase cPPR12	Increase cPPR23	Coeff. cPPR34
15-19	-0.0075	+0.0280	0.572
20-24	+0.0068	+0.0160	0.532
25-29	+0.0044	+0.0073	0.495
30-34	+0.0124	+0.0034	0.668
35-39	+0.0030	-0.0078	1.000

References

Beaujouan, E., Sobotka, T., Brzozowska, Z., Zeman, K., 2007. “Has childlessness peaked in Europe?”, *Population et sociétés*, n° 540.

Beaujouan, E., Brzozowska, Z., Zeman, K., 2016. “The limited effect of increasing educational attainment on childlessness trends in twentieth-century Europe, women born 1916–65”, *Population Studies*, 70(3), p. 275-291.

Beaujouan, E., Toulemon, L. 2021. “European countries with delayed childbearing are not those with lower fertility”, *Genus*, 77(2).

Breton, D., Prioux, F., 2005. “Deux ou trois enfants ? Influence de la politique familiale et de quelques facteurs sociodémographiques”, *Population*, 60(4), p. 489-522.

Breton, D., Prioux, F., 2009. “The one-child family: France in the European context”, *Demographic Research*, 20, p. 657-692.

Breton, D., Barbieri, M., d’Albis, H., Mazuy, M., 2018. “L’évolution démographique récente de la France. Naissances, décès, unions et migrations : à chacun sa saison”, *Population*, 73(4), p. 623-692.

Couet, C., 2006. “L'échantillon démographique permanent de l’Insee”, *Courrier des statistiques*, n° 117-119, p. 5-14.

Davie, E., Mazuy, M., 2010. “Fécondité et niveau d'études des femmes en France à partir des enquêtes annuelles de recensement”, *Population*, 65(3), p. 475-511.

Frejka, T., Sobotka, T., 2008. “Fertility in Europe: Diverse, delayed and below replacement”, *Demographic Research*, 19, p. 15-46.

Hellstrand, J., Nisén, J., Miranda, V., Fallesen, P., Dommermuth, L., Myrskylä, M., 2021. “Not Just Later, but Fewer: Novel Trends in Cohort Fertility in the Nordic Countries”, *Demography*, 58(4), p. 1373-1399.

Insee, 2019. *Base études 2017 de l’Échantillon Démographique Permanent, manuel de l’utilisateur*, 473 p.

Papon, S., Beaumel, C., 2021. “ Bilan démographique 2020. Avec la pandémie de Covid-19, nette baisse de l’espérance de vie et chute du nombre de mariages”, *Insee Première*, n° 1846.

Robert-Bobée, I., 2006. “Etudier la fécondité en France à l’aide de l’échantillon démographique permanent”, *Courrier des statistiques*, n° 117-119, p. 15-20.

Robert-Bobée, I., Gualbert, N., 2021. “L'échantillon démographique permanent : en 50 ans, l’EDP a bien grandi !”, *Courrier des statistiques*, N6, p. 47-63.

Toulemon, L., Mazuy, M., 2001. “Les naissances sont retardées mais la fécondité est stable”, *Population*, 56(4), p. 611-644.

Toulemon, L., Pailhé, A., Rossier, C., 2008. “France: High and stable fertility”, *Demographic Research*, 19, p. 503-556.

Wood, J., Neels, K., Kil, T., 2014. “The educational gradient of childlessness and cohort parity progression in 14 low fertility countries”, *Demographic Research*, 31, p. 1365-1416.

Zeman, K., Brzozowska, Z., Sobotka, T., Beaujouan, E., Matysiak, A., 2017. “Cohort Fertility and Education Database. Methods Protocol.” Available at www.cfe-database.org (accessed on [date]).

Zeman, K., Beaujouan, E., Brzozowska, Z., Sobotka, T., 2018. “Cohort fertility decline in low fertility countries: Decomposition using parity progression ratios”, *Demographic Research*, 38, p. 651-690.