The role of cohorts in the understanding of the changes in fertility in Czechia since 1990

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ABSTRACT

This article presents a detailed analysis of the fertility changes in Czechia since 1990 using the cohort approach and contributes to the overall understanding of the fertility postponement process. Because the timing of childbearing since 1990 has changed significantly, particular attention is devoted to the differences in the timing of fertility between cohorts. Data from the Human Fertility Database was analyzed via both standard (based on age-specific fertility rates) and advanced methods (postponement and recuperation indicators, parity progression ratio). Four groups of cohorts with specific fertility patterns were identified: 1965–1970, 1971–1976, 1977–1982, and 1983–1990. These groups were impacted by the political, economic and social transformation of the 1990s, the financial crisis of 2008–2012 and other socio-economic changes during the study period in different ways. While the 1965–1970 cohort was associated with the rapid occurrence of postponement, it still reflected the early fertility pattern. The 1971–1976 cohort was associated with the most intensive degree of postponement, the 1977–1982 cohort can be linked to the onset of the deceleration of the postponement process, and the 1983–1990 cohort appears to be the first to stabilize their fertility at later ages.

KEYWORDS

fertility patterns; Czechia; cohort analysis; postponement and recuperation; parity progression ratio

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1. Introduction

Following the Velvet Revolution of 1989, Czech society experienced a large number of changes. The most important processes comprised the transformation of the political system towards democracy and that of the centrally-planned economy to a market economy. These changes also influenced the reproductive behavior of Czech couples as indicated by trends in the level and timing of fertility (Kocourková and Fait 2011; Polesná and Kocourková 2016; Kurkin et al. 2017; Křesťanová and Kurkin 2020). The total fertility rate decreased markedly during the 1990s (from 1.91 in 1990 to 1.14 in 1999); while it has since recovered significantly, it remains below an average of two children per woman (TFR 1.66 in 2019; see Figure 1). Despite the decline in fertility, the ideal and planned family size has remained practically unchanged. Most Czech men and women, as with other Europeans, wish to have two children (Šťastná 2007; Rabušic and Chromková Manea 2013; Sobotka and Beaujouan 2014). The drop in the period fertility rate was accompanied by a gradual increase in the mean age of women at childbirth, which was particularly dramatic in the 1990s (see Figure 1). The period mean age of women at childbirth was 24.8 years in 1990 and 30.2 years in 2019. This increase was driven mainly by changes in the timing of fertility, i.e. by the delaying of fertility rather than by changes in the birth order composition (a decrease in third and higher order fertility) (Křesťanová 2016; Sivková and Hulíková Tesárková 2012).

The change in the mean age at motherhood has been considered by many researchers who have published on the topics of the postponement of fertility and later childbearing (see for example Sobotka 2017; Šprocha and Bačík 2020; Beaujouan 2020; Kocourková and Šťastná 2021, etc.). Generally, the fertility postponement process has been described as the consequence of value changes, the increasing individualization of society (Lesthaeghe 2010) and overall increasing economic uncertainty (Kohler, Billari, and Ortega 2002; Billingsley 2010). Recent studies on value-related changes have stressed the impact of education since it is becoming increasingly clear that the higher education of women has contributed significantly to the explanation of changes in fertility timing (Ní Bhrolcháin and Beaujouan 2012; Neels et al. 2017). The argumentation concerning the increasing role of the education effect on fertility timing also appears to be valid in the case of Czechia, where the proportion of students, in particular women, in tertiary education has been increasing gradually since 1990 (Czech Statistical Office 2014; Kurkin et al. 2017).

As regards economic uncertainty, the effect on fertility timing can be understood in two ways, as a temporal uncertainty related to the life stage (e.g. during study or at the outset of a career) or as a temporal uncertainty driven by macro-economic forces (e.g. an economic crisis). The postponement of fertility due to economic uncertainty leads to a temporary decline in period fertility rates. In Czechia, the effect of economic factors can be identified from 1990 onward (see Figure 1). Firstly, the drop in total fertility rates during the 1990s was related to the initial period of economic transition from 1990 to 1996 when Czech GDP declined beyond the stagnation level (Vltavská and Sixta 2015). Following a recovery in the period fertility rate in the 2000s, a further drop in fertility occurred after the start of the global financial crisis in 2008 (Kocourková et al. 2019). Interestingly, the total fertility rate initially stagnated and subsequently declined temporarily (see Figure 1). Since 2013, the total fertility rate has been increasing. The study of the effect of the financial crisis on the reproductive behavior of Czech women at the individual level determined that the experience of unemployment during the economic crisis led to the further unplanned postponement of first childbirth (Slabá 2020).

The events of the 1990s led to changes in Czechia that can easily be observed from the period perspective, and they have been subjected to analysis on a regular basis (see Křesťanová and Kurkin 2020). We expect that these period changes exerted a major influence on the respective birth cohorts and led to the transformation of their fertility behavior. Figure 1 shows that the cohort fertility rate has been decreasing continuously since the late 1950s cohorts. However, the continuous increase in the mean age of mothers at childbirth began later, i.e. with the 1966 cohort. There is currently a lack of a more detailed cohort analysis of fertility in Czechia. Recent studies indicate that the clarification of cohort differences can help us to understand long-term changes in fertility (Šťastná et al. 2017; Šťastná et al. 2019; Slabá 2020).

The aim of the study is to present a detailed analysis of fertility changes in Czechia over the last three decades using the cohort approach and to contribute to the overall understanding of the fertility postponement process. Whereas previous studies on fertility postponement and recuperation in Czechia (Sobotka et al. 2011; Šprocha 2014; Šprocha et al. 2018) have analyzed the underlying trends without the assessment of cohort differences, this paper aims to compare cohort differences in terms of the level and timing of fertility in more detail in order to identify the various "steps" in the transformation of reproductive patterns in Czechia. We take into account that each cohort has its own unique position in the course of history; thus, each cohort is differentiated from the other cohorts considered. The main focus of the study comprises the examination of birth parities and their role in changes in reproductive patterns. Parity is observed up to the third childbirth since the first, second and third births have made up more than 95% of total fertility since 1989. Accordingly, the main aim is to distinguish those groups of cohorts that exhibit

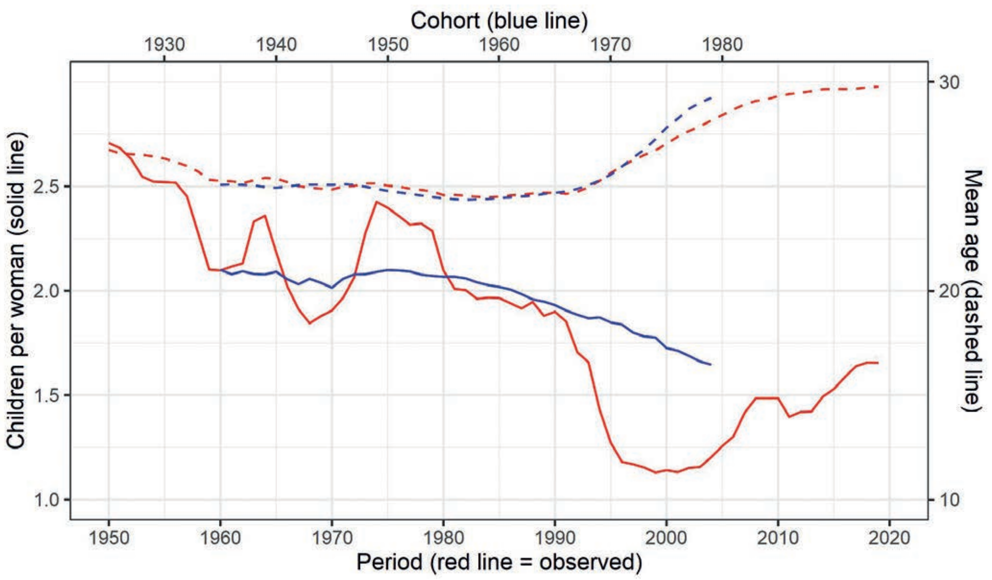

Fig. 1 Trends in the period and cohort fertility rates of women up to the age of 40, as well as in the period and cohort mean age of women at childbirth in 1950–2018 and for the generations from 1935 to 1978.
Notes: Both the fertility rates and the mean ages were computed for women up to the age of 40. The cohort fertility rates were shifted by 25 years (the 1965 generation corresponds to 1990 in the figure) as the mean age of women at childbirth before 1990.
Data: Human Fertility Database

specific fertility patterns since the transition to parenthood and parenthood itself are influential factors for the whole of adult life, which may well make a difference in terms of the social, political and economic features of each cohort group.

2. The cohort analytical approach and cohort differences in Czech society

The study of the cohort perspective aimed at enhancing the understanding of demographic processes and social changes is not a new approach. A paper on the cohort approach to the study of social changes was published as early as in the mid-1960s (Ryder 1965). Ryder considered cohort differentiation through social norms (the age at the completion of education or at first marriage), the impact of the size of the cohort on competitiveness during the life course (university entrance examination, the labor market) and the impact of contextual historical events. Wunsch et al. (2021) suggest that the cohort approach is applied when time trends are examined period by period and discussed in the causal perspective by taking into account the historical contexts of the periods considered.

The life trajectories of Czech women before 1989 were highly standardized with the almost universal transition into marriage and parenthood at a relatively low age (Sobotka et al. 2008). The political and economic change of the 1990s, however, led to the significant diversification of life trajectories (Bartošová et al. 2012). The opportunities for study, travel and other types of self-realization were significantly expanded. Therefore, intensive changes in social norms were observed in the 1990s in tandem with a decrease in marriage and fertility rates and an increase in the number of children born outside wedlock (Rabušic 2001). An example of the diversification of life trajectories is provided in Morávková and Kreidl (2017), who identified cohort differences in the partnership trajectories of solo mothers in terms of more recent cohorts having a higher chance of the transition to co-residential partnerships than older cohorts. They interpreted this development as the effect of a de-standardized life trajectory in which childbirth preceded cohabitation with the father of the child, and as the result of the significant de-stigmatization of 'solo-motherhood' compared to before 1989, both of which led to the easing of the settings of new co-residential partnerships.

As period fertility rates have become progressively distorted by timing shifts, the cohort approach has become increasingly appropriate in terms of the analysis of fertility transformation over the last two decades (Frejka and Calot 2001; Frejka 2011). The cohort approach views postponement and recuperation as being interconnected within the life course history. However, both the postponement and recuperation phases are subject to period effects, which differ since postponement and recuperation occur at different times. We acknowledge that changes in fertility are both cohort and period driven without discussing whether the cohort effects are more or less important than the period effects in terms of driving the observed fertility trends. Sobotka et al. (2011) introduced a new analytical approach that served for the description of the intensity of the decline in fertility caused by postponement and subsequent recuperation from the cohort perspective. The application of this approach clearly illustrates the effect of fertility postponement on temporal declines in the period fertility rate.

The postponement process, which influenced the decrease in the period fertility rate, appears to have played a major role in fertility postponement in Czechia. The cohort analytical approach highlights the differences in fertility timing across cohorts. Moreover, it assists in the identification of which birth order was most postponed and which postponed children were born later, and the extent to which the probability of having an order-specific child has changed.

3. Data and Methods

All the analysis was conducted using R via R Studio statistical software (RStudio Team 2020). The data for Czechia was taken from the Human Fertility Database (Human Fertility Database 2020) using R package HMDHFDplus (Riffe et al. 2020).

3.1 Indicators of postponement and recuperation

The calculation of the following indicators is based on a paper by Sobotka et al. (2011). Following the example of previously conducted studies of the Czech population (Šťastná et al. 2017; Šprocha 2014), the benchmark cohort was set as the 1965 cohort since the continuous dynamic increase in the cohort mean age of mothers at first birth has been identified from the 1966 cohort onward. Postponement was measured via the cumulation of the fertility decline for the younger-aged mothers registered in these cohorts in comparison with the 1965 cohort. The cumulative postponement and recuperation indicators were based on the following equations (Sobotka et al. 2011):

[1] The *cumulative fertility rate of cohort* (F_c) based on the age-specific fertility rates (f_c) at age (x). The cumulating of age-specific fertility rates from the minimum age (12) to the maximum age (55) across a specific birth cohort results in the *complete cohort fertility rate* (*CCFR*).

$$F_C(y) = \sum_{x=12}^{y-1} f_C(x)$$

[2] The *difference* in the cumulative fertility rate between (F_c) (where c is the observed cohort of 1966 to 1990) and the benchmark cohort (F_{1965}).

$$F_c(y) - F_{1965}(y)$$

[3] The *age of the trough* (m) is the age at the maximum difference in age between the cumulative fertility rate of the observed cohort ($F_c(m)$) and the benchmark cumulative fertility rate ($F_{1965}(m)$). The trough age (m) may differ for each cohort as shown in detail in Appendix.

[4] The *indicator of postponement* (cumulative fertility decline) (P_c) is the difference between the cumulative fertility rate of the observed cohort ($F_c(m)$) and the benchmark cumulative fertility rate ($F_{1965}(m)$) at the age of the trough m between the observed cohort (c) and the benchmark cohort (1965).

$$P_c = \sum_{x=12}^{m-1} [f_c(x) - f_{1965}(x)] = F_c(m) - F_{1965}(m)$$

[5] The *indicator of recuperation* (cumulative fertility increase) (R_c) is then observed after the age of the trough (m). It serves for the measurement of the absolute cumulative increase in fertility between the trough age and the end age of the reproduction period.

$$R_c = \sum_{x=m}^{55} [f_c(x) - f_{1965}(x)]$$

[6] Finally, the *recuperation index* is computed as the proportion of recuperation of the cumulative fertility decline.

$$RI_c = {}^{R_c}/_{-P_c}$$

This paper considers the recuperation and recuperation index indicators up to the following ages: 35, 40 and 45.

3.2 Inter-cohort change in the cumulative fertility decline

The cumulative fertility decline (P_c) defines the maximum difference in the cumulative fertility between the benchmark and the observed cohort; hence, this value varies for each cohort. The inter-cohort change in the cumulative fertility decline (ICP_c) serves for the measurement of the absolute intensity of growth/decline between two adjacent cohorts (P_c).

[1] This is equal to the cumulative decline for the benchmark cohort.

$$ICP_{1965} - P_{1965}$$

[2] For the other cohorts it comprises the difference in the cumulative fertility decline between the observed cohort (P_c) and the cohort that is one year older (P_{c-1}).

$$ICP_C = P_c - P_{c-1}$$
$$= F_c(m) - F_{1965}(m) - (F_{c-1}(m) - F_{1965}(m))$$
$$= F_c(m) - F_{1965}(m) - F_{c-1}(m) + F_{1965}(m)$$
$$= F_c(m) - F_{c-1}(m)$$

[3] The values for the inter-cohort change in the cumulative decline (ICP_c) are then smoothed out as the average of the three adjacent cohorts.

$$avg(ICP_c) = \frac{ICP_{c-1} + ICP_c + ICP_{c+1}}{3}$$

3.3 Cumulative growth in the mean age of women at childbirth

The cumulative growth (CG) for cohort (c) is based on the mean age of the cohort at childbirth computed for women up to the age of 40 (MAB). In contrast to the related benchmark, the cumulative growth exhibits a change in the mean age of the mother at childbirth. The benchmark cohort was set as the 1965 cohort for this reason. The indicator was computed as parity specific (i). The final available mean age at childbirth up to the age of 40 value related to the 1979 cohort.

$$CG_i(c) = \sum_{c=1965}^{c} (MAB_i(c) - MAB_i(c-1))$$

3.4 Parity progression ratio

The parity progression ratio describes the probability of having a child of a specific birth order, provided that the woman already holds the status of one child less than is the specific order. We computed the transition to a first child (from the status of childless), the transition to a second child (from the status of one child) and the transition to a third child (from the status of two children). The progression ratio was computed as the proportion of the cumulative fertility rate up to a specific age (for the purposes of this paper, up to the ages of 30, 35, 40 and 45).

[1] The parity progression (PP) from childlessness to the first child was equal to the first birth fertility. The $CCFR_p$ comprises the completed cohort fertility rate of a specific parity (birth order).

$$PP_1 = CCFR_1 = \sum_{x=12}^{y} f_1(x)$$

[2] The parity progression from one child to a second child was computed as the cumulative fertility rate of the second birth divided by that of the first birth.

$$PP_2 = CCFR_2/CCFR_1$$

[3] The parity progression from two children to a third child was computed as the cumulative fertility rate of the third birth divided by that of the second birth.

$$PP_3 = CCFR_3/CCFR_2$$

4. Results

4.1 Fertility postponement in the 1965–1990 cohorts

Aimed at identifying the various "steps" in the transformation of reproductive patterns in Czechia, we commenced with the analytical approach as proposed

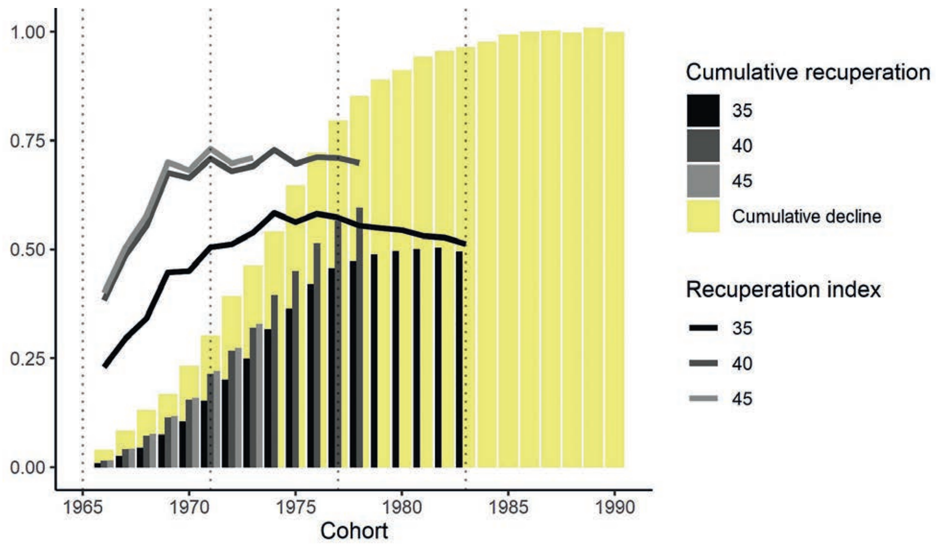

Fig. 2 Postponement and recuperation of fertility, cohort approach.
Note: Cohort 1965–1978 (1990), benchmark: the 1965 cohort; y axis = cumulative decline, cumulative recuperation, recuperation index/100.
Data: Human Fertility Database

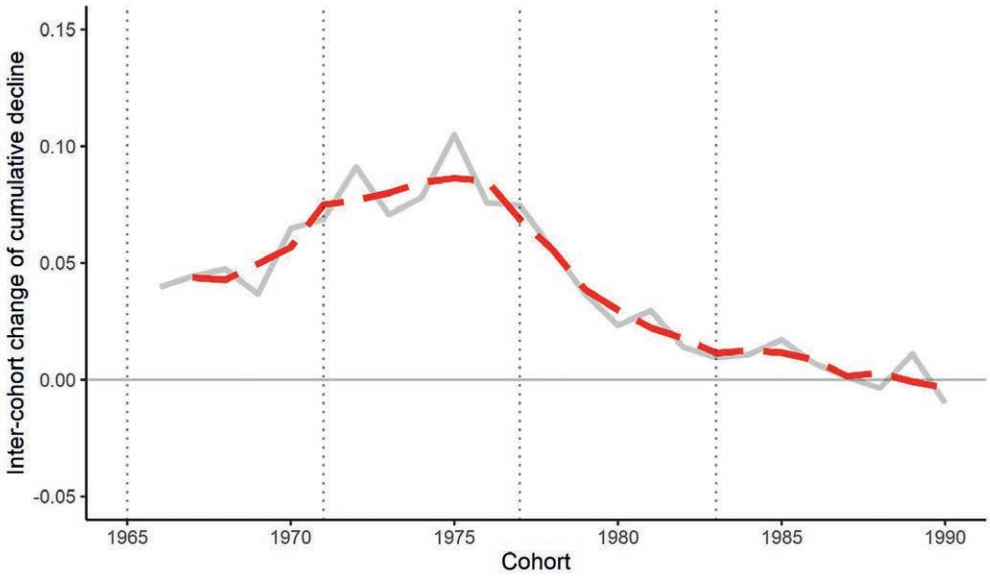

Fig. 3 Inter-cohort changes in the decline in cumulative fertility.
Note: The gray line represents the observed change for each cohort; the red long-dashed line illustrates the three-year average.
Data: Human Fertility Database

by Sobotka et al. (2011) so as to analyze the dynamics of the postponement and recuperation of cohort fertility. The yellow columns in Figure 2 represent the cumulative fertility decline for each observed cohort compared to the benchmark cohort of 1965. The cumulative fertility decline increased continuously with each cohort, but slowed down gradually from the cohorts born after the mid-1970s onward. The difference in the cumulative fertility intensity between the 1965 and 1990 generations was 1.00 child.

The tempo of the cumulative fertility decline accelerated up to the 1970 cohort, with each subsequent generation experiencing a more intense reduction in fertility at younger ages than the previous generation (Figure 3). The tempo of the cumulative decline was highest for the 1971 to 1976 cohorts, for which, on average, the cumulative fertility at younger ages decreased for each subsequent generation by 0.08 children per woman compared to the previous generation. The growth in the cumulative decline slowed down between the 1977 and 1982 cohorts, and the cumulative fertility decline was close to zero for the 1983 cohort, thus indicating the cessation of postponement. Accordingly, four steps in the postponement transition process were identified based on the following cohorts: 1965–1970, 1971–1976,

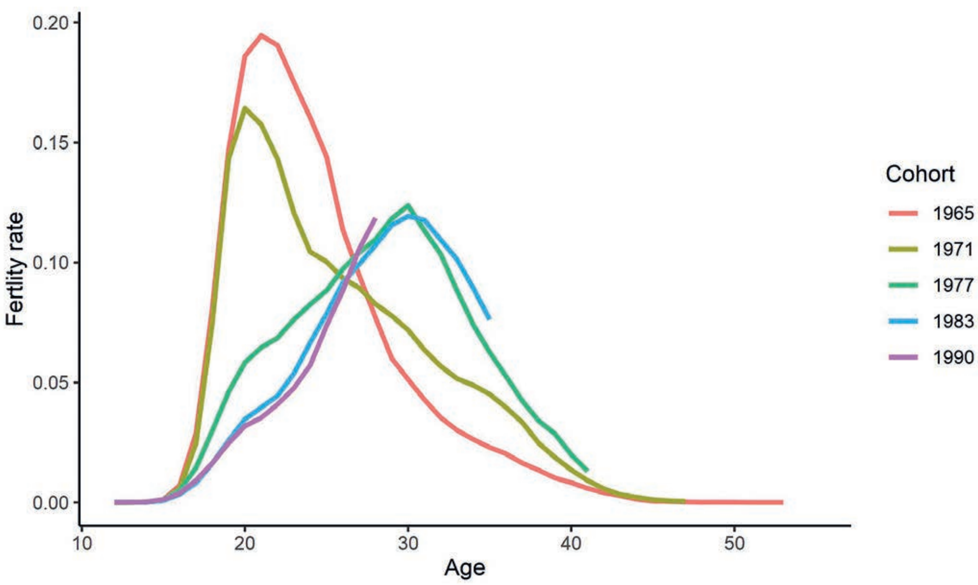

Fig. 4 Fertility rate age patterns for selected cohorts.
Data: Human Fertility Database

1977–1982, and 1983–1990. Finally, two main groups were differentiated: 1965–1982 (cohorts that were characterized by various postponement intensities) and 1983–1990 (cohorts that ceased further postponement).

Figure 4 presents the age-specific fertility rates of women for selected cohorts chosen so as to follow the previously identified fertility postponement stages: 1965, 1971, 1977, 1983 and 1990. The fertility of the 1965 cohort was concentrated mainly between the ages of 19 and 25 with a peak at the age of 21. The 1971 cohort appears to represent the first stage of the fertility postponement process, and is characterized by decreasing fertility rates at younger ages and increasing fertility rates over the age of 27; however, it continues to follow the previous early-fertility pattern. A completely different pattern was observed for the 1977 cohort, who shifted the dominance of their fertility to a median age of 30. Nevertheless, the fertility rates up to the age of 27 remained significant. Finally, a similar late-fertility pattern with significantly lower fertility up to the age of 28 was determined for both the 1983 and 1990 cohorts, thus confirming the stabilization of the postponement transition process.

4.2 The timing of fertility by birth order from the cohort perspective

In order to compare fertility across all the cohorts of interest in detail, Figure 5 presents the fertility rates of all the birth orders together and for the first, second and third childbirth. In the case of first childbirth, the dominant age category for the 1965–1970 cohorts comprised the 20–24 age group that featured a fertility rate decline of from 0.5 to 0.4. The second highest fertility was registered for the 15–19 age group. The distribution then changed significantly from the 1971 cohort onward. The first-child fertility of the 25–29 age group increased to above that of the 15–19 age group (from the 1974 cohort) and, subsequently, to above the formerly dominant 20–24 age group (from the 1977 cohort). Moreover, the importance of the 30–34 age group was reflected in its outstripping the fertility of the 20–24 age group from the 1981 cohort onward (see Figure 5).

A similar trend is evident with concern to second birth rates. Women between 20 and 24 lost their dominance, while women in the 30–34 age group exhibited an increasing second-birth fertility intensity (Figure 5). A shift in fertility is also evident with respect to third childbirth, with the 30–34 and 35–39 age groups becoming dominant from the 1971 generation onward (Figure 5).

As indicated by the above detailed analysis of cohort age-specific fertility rates, the fertility of each birth order was postponed progressively to later ages. The mean age of women at first birth increased from 22.5 years for the 1965 cohort to 27.4 years for the 1979 cohort (Figure 6). Similarly, the mean age of women increased from 25.8 to 30.6 for second births and from 29.0 to 32.7 for third births. However,

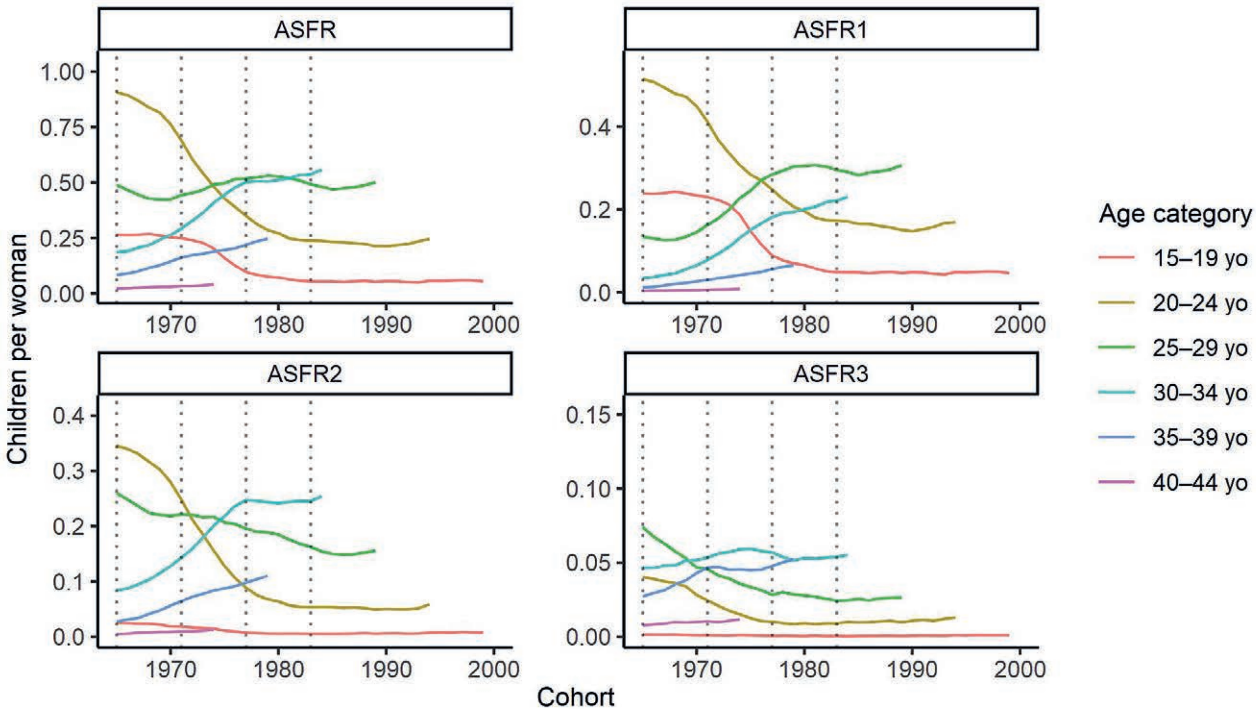

Fig. 5 Fertility rate cohort patterns for the five-year groups.
Note: Cohort 1965–2000. ASFR represents the rates for all the childbirth orders, ASFR1 represents first births, ASFR2 second births and ASFR3 third births.
Data: Human Fertility Database

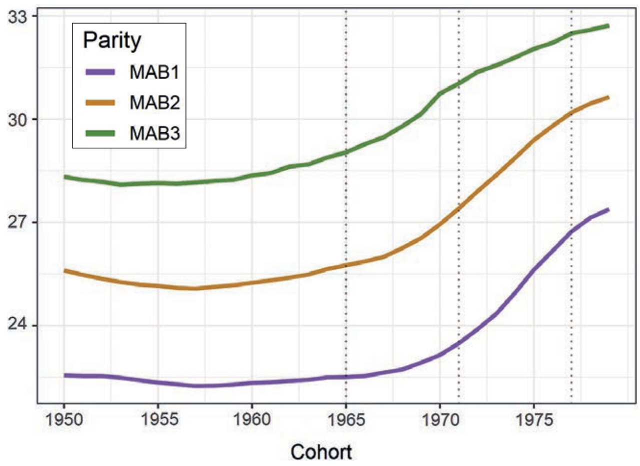

Fig. 6 Mean age of women at childbirth by parity, cohort 1950–1979.
Notes: The mean ages were computed for women up to the age of 40.
Data: Human Fertility Database

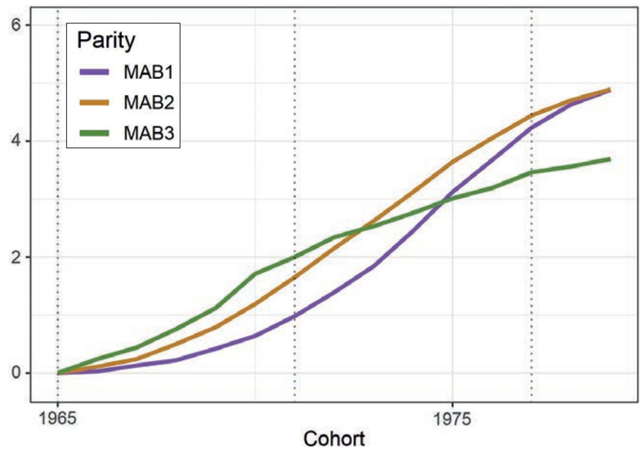

Fig. 7 Cumulative growth in the mean age of woman at childbirth (by parity).
Notes: Both the fertility rates and the mean ages were computed for women up to the age of 40. The vertical lines show the 1971 and the 1977 cohorts.
Data: Human Fertility Database

indications of such an increase were apparent for second- and third-order births as early as in the 1960–1964 cohorts. Therefore, Figure 7 was compiled so as to illustrate the cumulative increase in the mean age at childbirth by birth order from the 1965 benchmark cohort. While the postponement of third childbirth commenced earlier than that of the lower birth orders, the increase decelerated from the 1971 cohort onward. The cumulative first-order increase was slowest with respect to the 1971 cohort, whereupon the cumulative increase accelerated for both first- and second-order births and outstripped third-order births. A more intensive cumulative increase in first- and second-order births than for third-order births was evident for the 1977 to 1982 cohorts.

4.3 Fertility postponement and recuperation by birth order

Both the intensity and recuperation of postponement were examined, i.e. to what extent delayed childbearing was realized at older ages following the trough age. Overall, from the 1965 cohort to the 1971 cohort, the maximum difference between the cumulative fertility rates was 0.30 children per woman (the yellow column in Figure 2; the age of 27 represented the trough for the 1971 cohort, see the Appendix). 0.22 children per woman was born between the trough age and the age of 45 (the light gray column in Figure 2), thus indicating that 70% of postponed childbirths were recuperated (the light gray line in Figure 2). The dark gray and black columns and lines show the cumulative recuperation and recuperation indices up to the ages of 40 and 35, respectively. While the 1965–1970 cohorts registered a low but increasing recuperation index, the 1971–1976 cohorts registered a high and constant recuperation index up to the age of 40 of around 70%. The 1977–1982 cohorts experienced an intensifying cumulative fertility decline of up to 0.96 children (trough age = 26) accompanied by a later cumulative fertility increase (recuperation) of only 0.50 children per woman up to the age of 35. Thus, the recuperation index at the age of 35 decreased to just 53% (Figure 2).

The development of the cumulative decline, cumulative increase and recuperation indices differed according to the specific birth order (Figure 8). The cumulative fertility decline for the first-birth order reached a value of 0.42 children for the 1977 cohort and up to 0.56 children for the 1990 cohort. Although the recuperation index showed an increasing trend up to the 1969 cohort, it subsequently fluctuated at around 83% (the recuperation index up to the age of 40). In the case of second childbirths, the cumulative fertility decline was 0.36 children for the 1977 cohort and 0.43 children for the 1990 cohort. Therefore, the cumulative fertility decline due to postponement for the second childbirth was lower than for the first childbirth. The recuperation index for the second childbirth was also lower, i.e. 72% on average (up to the age of 40) for the 1971 to 1976 cohorts. The cumulative fertility decline was much lower for third-order births than for lower-order births. The maximum decline was 0.09 children per woman (the 1983 cohort). The average recuperation index value up to the age of 40 for the 1966–1976 generation was approximately 53%.

The progression ratios indicate the probability of transition to a subsequent child and were computed up to the ages of 30, 35, 40 and 45. The trends in the parity progression ratios once again highlight the postponement of fertility to later ages. As shown in Figure 9, the parity progression up to the age of 45 and 40 remained the same for these cohorts, while

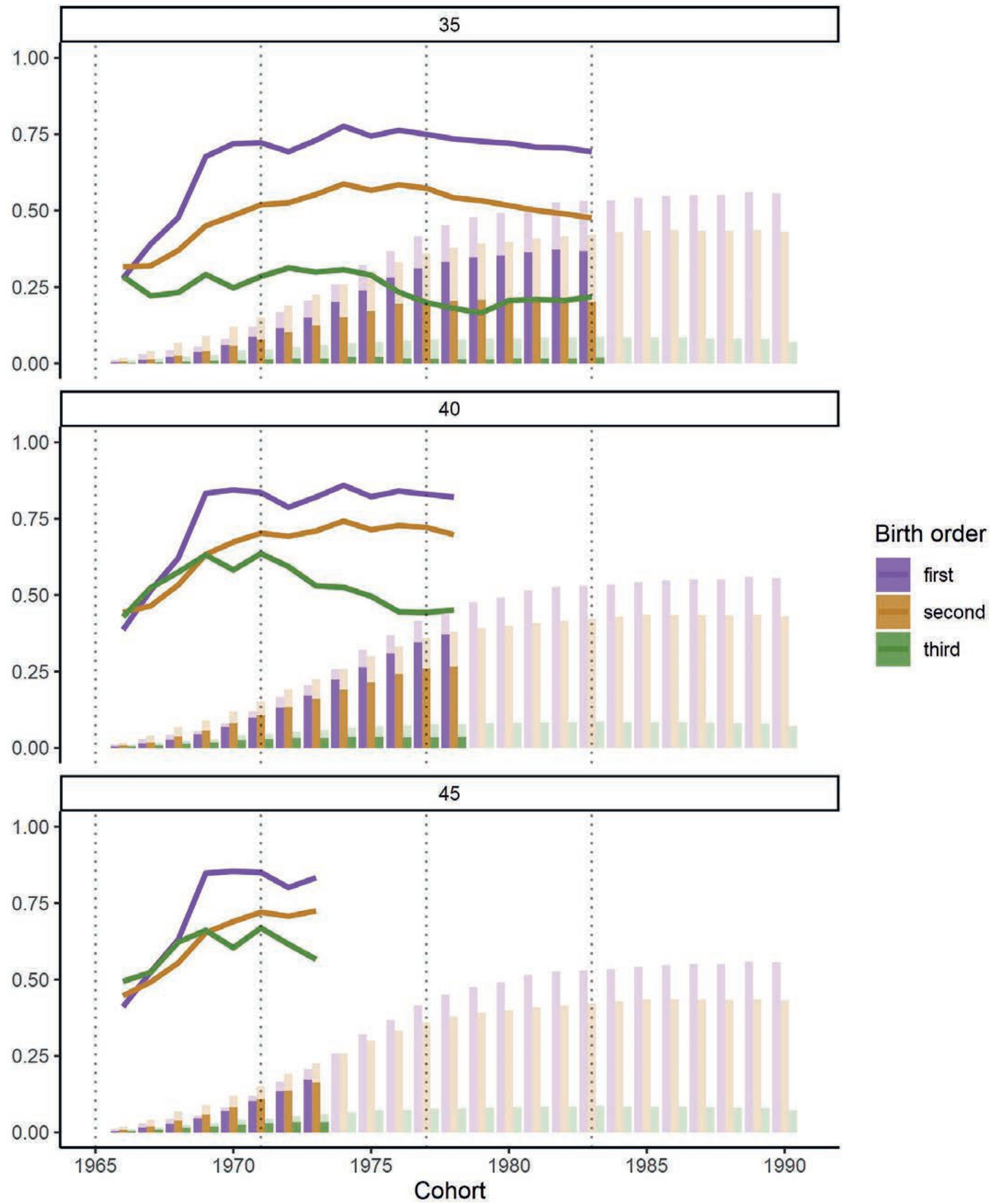

Fig. 8 Postponement and recuperation, cohort approach (parity comparison).
Note: 1965–1978 cohort (1990), benchmark: the 1965 cohort; y axis = cumulative decline (shaded columns), cumulative recuperation (colored columns), recuperation index/100 (lines).
Data: Human Fertility Database

the parity progression up to the age of 35 declined slightly, and the parity progression up to the age of 30 decreased significantly, especially with concern to the younger cohorts. Changes in the progression ratio up to the age of 30 illustrate the postponement of a significant amount of fertility to 30 years and older.

The highest progression ratio related to the transition from childlessness to a first child. The probability of having a first child by the age of 40 was still above 90% for the 1971 cohort and was close to 85% for the 1977 cohort (Figure 9). Changes in childbirth timing are more noticeable with concern to the parity progression trends up to the age of 30, which was 89% (i.e. only 4 percentage points lower than up to the age of 40) for the 1965 cohort and just 60% (i.e. 25 percentage points lower than up to the age of 40) for the 1977 cohort. The progression ratio to a first child decreased for the subsequent cohorts up to 1982 and stabilized at around 50% from 1983 onward.

A similar decline in the progression ratio up to the age of 40 was also evident between the 1965 and 1977 cohorts in the case of the transition to a second child (from 80% to 73%). However, the probability of having a second child decreased significantly when computed only to the age of 30 (from 71% for the 1965 cohort to 46% for the 1977 cohort, and to close

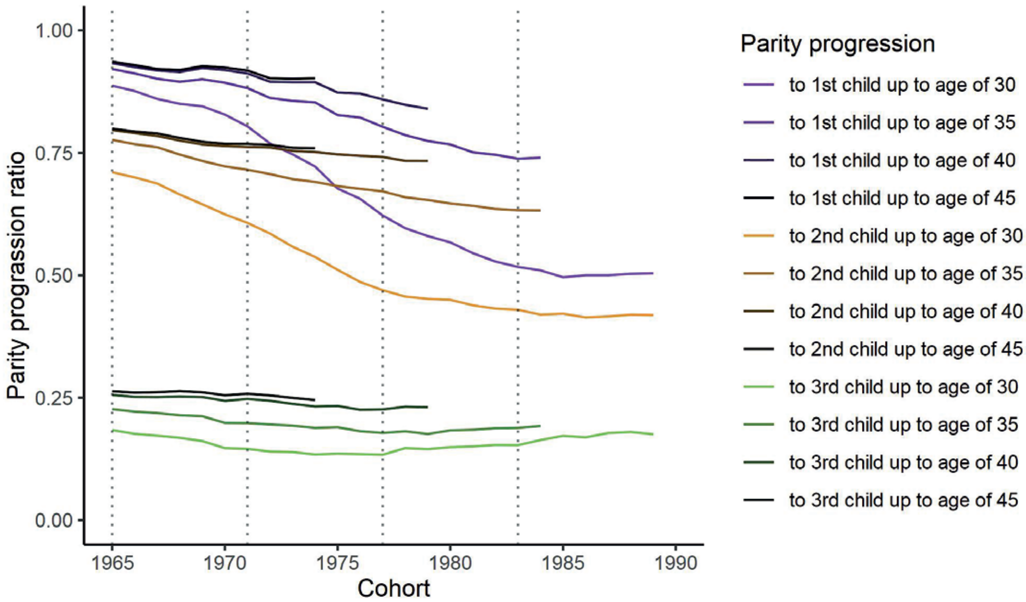

Fig. 9 Parity progression ratios.
Note: 1965–1990 cohort.
Data: Human Fertility Database

to 40% for the 1982 and subsequent cohorts). The progression ratio from the second to a third child did not change significantly, i.e. it stabilized at the much lower value of around 25%.

4.4 Defining cohort differences in fertility patterns

The aim of the above analysis was to identify detailed differences in fertility patterns across the four cohort groups.

The first cohort group (1965–1970) was characterized by the rapid commencement of the postponement process. Nevertheless, early fertility remained the typical pattern; the women in this cohort group mainly had a first child at the age of 20–24 (Figure 5), and the 15–19 age group was the second most fertile group. Up to the age of 45, the parity progression ratios to a first, second and third childbirth remained stable (92%, 78% and 23%, respectively). Nevertheless, the parity progression ratio up to the age of 30 decreased continuously between the 1965 and 1970 cohorts for both first and second births, thus indicating a gradual postponement of fertility toward the age of 30 and older (Figure 9). Interestingly, second childbirth postponement was more intense than first childbirth postponement (Figure 8), as confirmed by the trends evident in Figure 3 that show that the mean age at childbirth first began to accelerate with concern to higher-order births. The recuperation index for all the childbirth orders up to the age of 45 increased (85% for a first, 69% for a second and 60% for a third childbirth).

The second cohort group (1971–1976) was characterized by the most intensive rate of postponement. These women continued to have their first child predominantly at the age of 20–24; however, the fertility rate of this age group subsequently decreased at a constant rate. Conversely, fertility at the ages of 25–29 and 30–34 increased significantly (Figure 5). The progression ratio up to the age of 40 reflected a decrease in the probability of having a first, second or third child (Figure 9). While the recuperation index up to the age of 40 remained stable for both the first and second childbirth (82% for the first and 71% for the second), the third childbirth recuperation index decreased continuously from 64% to 45% (Figure 8).

The third (1977–1982) cohort group experienced a deceleration in fertility postponement. In 2020, these cohorts were approaching the end of their reproductive age, i.e. 38–43. These women predominantly had their first child aged 25–29, while the second most fertile age group in terms of first childbirth comprised the 30–34 age range (Figure 5). The parity progression ratios for the whole of the group can be observed only up to the age of 35 (Figure 9). The transition to a first child continued to decline with respect to these cohorts. The probability of having a first child up to the age of 35 was 80% for the 1977 cohort and 75% for the 1982 cohort. The probability of having a second child (in the case that the woman already had a first child) also slightly decreased from 67% to 64% between the 1977 and 1982 cohorts. Conversely, the progression rate to a third child up to the age of 35 increased slightly from 18% to 19% between these cohorts. The recuperation index up to the age of 35 decreased slightly for a first childbirth from 75% for the 1977 cohort to 71% for the 1982 cohort. A second child was recuperated by just 57% of the 1977 cohort and 49% of the 1982 cohort.

The fourth (1983–1990) cohort group indicated signs of the stabilization of postponement. In 2020, these women were aged 30 to 37 years, and thus had not reached the end of their fertility. The age-specific fertility rates revealed the dominance of a first childbirth at the age of 25–29. The main question concerns whether the 30–34 age group becomes dominant or not (Figure 5). The progression ratios for a first and second child up to the age of 30 were determined at the low levels of 50% for the first child and 42% for the second child (Figure 9). The recuperation index of these cohorts is not yet known.

5. Summary and discussion

This paper aims to assist in forming an understanding of the role of cohorts concerning fertility trends in Czechia. Cohort differences in terms of the fertility level and timing were compared in detail so as to identify the various "steps" in the transition of reproductive patterns in Czechia. The results served to distinguish four groups of cohorts with distinct demographic characteristics and fertility patterns: the 1965–1970 cohorts, 1971–1976 cohorts, 1977–1982 cohorts and 1983–1990 cohorts.

Four periods of significant change in economic development can be identified in recent Czech history, all of which were reflected in specific fertility trends. The period indicators clearly show that these periods differed in terms of the potential effect on fertility (Rychtaříková 2000; Kocourková 2009). We determined that these periods exerted particularly profound impacts on reproductive behavior from the cohort perspective. The application of the cohort approach allowed for the observation of differences in behavior between the cohorts that could not be identified via the period indicators. The various time occurrences were then projected to the behavior of each generation, thus contributing to the identification of the particularities of the various cohorts.

Firstly, the political and economic transformation which began in the early 1990s and influenced the whole of that decade led to a sharp drop in the period fertility (Rychtaříková 2000). This was the time at which the first (1965–1970) cohort experienced the key reproductive age of 20–30. Most of the women in these cohorts continued to have a first child early (mostly before the age of 24), and the probability of their having a second child was above 76%. Early childbearing continued to be the dominant reproductive pattern. Nevertheless, this was the first group for which signs were observed of the postponement of childbirth to later ages. The second (1971–1976) cohort group was more profoundly affected by the ambivalence and uncertainty of the 1990s, which led to their postponing childbearing to a much more significant extent. Thus, they are considered to be the initiators of changes in reproductive patterns; in other words, the transitional cohort group.

From 2000, the period fertility increased, which has often been explained via the creation of a more favorable population climate that reflected the positiveness of continuous economic growth (Kocourková 2009). GDP grew at an accelerating pace from 2003 and reached 6.1% in 2005 (Jahoda and Kofroň 2007) in tandem with the introduction of favorable family and housing policy measures. However, the positive socio-economic development affected the initiators of fertility postponement only marginally, as reflected in their failure to recuperate a significant part of delayed childbirths. Women in their mid-thirties are less receptive to improved family support measures if they lacked favorable conditions when they were in their late twenties or early thirties (Kocourková and Šťastná 2021). We determined that the probability of their having a first and second child up to the age of 40 had declined (from 91% for the 1970 cohort to 85% for the 1976 cohort, and from 71% for the 1970 cohort to 56% for the 1976 cohort, respectively). It was left for the subsequent (1977–1982) cohort group, who were in their late twenties or early thirties at that time, to fully take advantage of the more favorable conditions for starting a family. This cohort group was characterized by the formation of the late-fertility pattern.

The period 2008 to 2012 was dominated by the world financial crisis, which was reflected in the stagnation and a temporal decrease in period fertility. However, the crisis lasted for a relatively short time (at least in Czechia) and resulted only in the temporal stagnation of period fertility (Kocourková et al. 2019). Finally, the continuation of economic growth from 2013, accompanied by favorable family policies, acted to stimulate a further increase in period fertility (Šťastná et al. 2020). Accordingly, the 1983–1990 cohort group witnessed the stabilization of the late-fertility pattern, with the balanced contribution of the 25–29 and 30–34 age groups. Indeed, the further postponement of childbearing appears to have been prevented by recent developments in family policy, as suggested by the example of the effect of parental leave policies (Šťastná et al. 2020).

While we can reasonably expect that the current Covid-19 pandemic will exert an impact on reproductive behavior, it is still too early to reliably predict the extent thereof.

The postponement of childbearing significantly influences the life course. Older mothers are faced with circumstances and needs that differ from those of younger mothers. The former are more likely to experience difficulties becoming pregnant due to sub-fecundity (Schmidt 2010), thus leading to a higher demand for assisted reproduction treatment (Kocourková and Fait 2009). Moreover, fertility at later ages is often connected with career disruption in the case that the woman has already entered the labor market. However, the same is true for childbirth immediately following the completion of tertiary education, with the resulting disruption of "up-to-date knowledge" and the devaluation of current investment in individual human capital. It has been estimated that the "motherhood penalty" in Czechia is around 7% (Žofková and Stroukal 2014). Aimed at reflecting these fertility patterns, the various challenges should be addressed via the introduction of the corresponding family policy strategies, and changes in fertility patterns should be considered a factor in terms of the future political and economic decision-making process.

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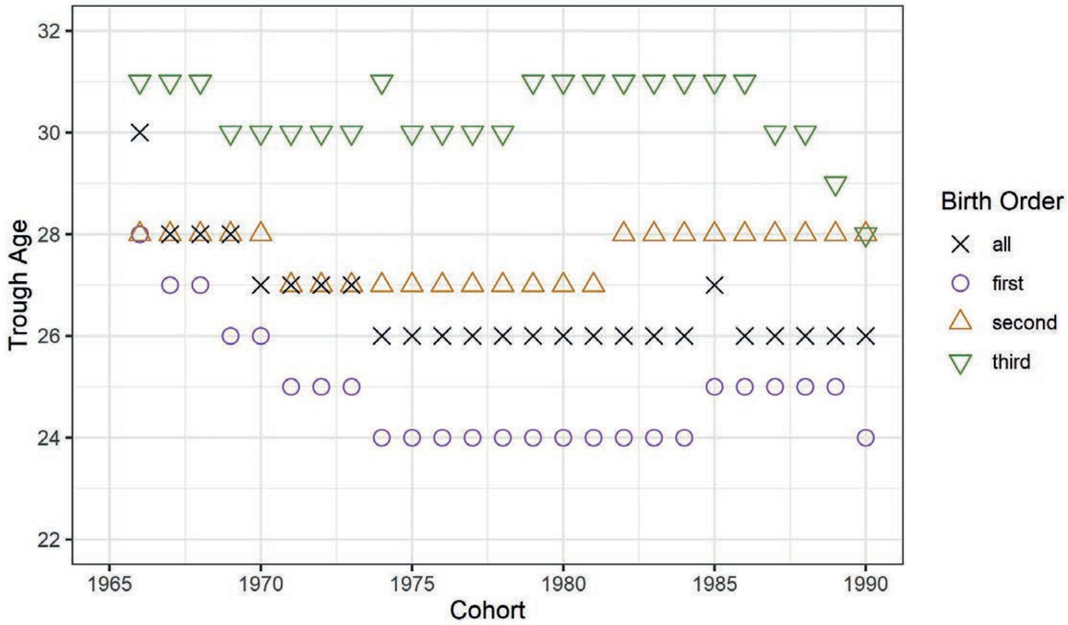

Appendix: Trough age.
Note: Cohort 1965–1990; benchmark: the 1965 cohort.
Data: Human Fertility Database