

# Changes in fertility quantum and tempo in Austria, the Czech Republic, and Slovakia. A parity-specific view

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## INTRODUCTION

The most common indicator of fertility, total fertility rate (TFR), suggest that fertility in Austria, the Czech Republic, as well as Slovakia has declined to very low levels. The Czech Republic and Slovakia experienced a particularly steep fall in total fertility during the 1990s, when the TFR dropped below the 'lowest-low' fertility threshold of 1.3 (see Kohler, Billari, and Ortega 2002). This rapid decline in the period TFR has been frequently interpreted as a 'crisis' reaction of the population to changing external conditions after the collapse of the state-socialist system in Central and Eastern Europe. For instance, in the case of the Czech Republic, Rychtaříková (2000) emphasized the influence of unfavourable economic conditions, such as high unemployment, inflation and economic crisis, which resulted in widespread uncertainty and consequently led to fertility decline.

However, period total fertility rates may give a misleading picture of fertility trends and changes. It is known already from the time of Hajnal's (1947) analysis of fertility increase following the baby-bust of the 1930s that the changes in the timing of childbearing may cause considerable fluctuations in period fertility. The interplay between changes in fertility timing and fertility level was extensively studied by Norman Ryder (e.g. Ryder 1980 and 1990). He demonstrated that the period total fertility rates are frequently distorted by the shifts in fertility timing ('tempo' of childbearing) and thus constitute an unreliable indicator of fertility level ('quantum'). When women postpone childbearing towards later ages, period total fertility may diverge substantially from the corresponding completed cohort fertility levels. When, on the other hand, an advancement of childbearing takes place, more births are realized in a given period than would correspond to the underlying fertility patterns and period total fertility rates are inflated upwards. Such a shift towards an earlier timing of childbearing may even result in absurd values of the usual indicators, suggesting, for instance that a women can have more than one first child on average (a similar analogy can be made in the case of first marriages when analysed with the total first marriage rates).

Demographers have started paying more attention to the distortions in period fertility indicators only recently, especially in relation to the widespread postponement of childbearing and very low fertility levels recorded in many European societies. It has become increasingly apparent that these two phenomena are closely related and that extremely low levels of total fertility are frequently caused by an intensive postponement of childbearing (Sobotka 2004a). For instance, in countries where the shift towards later family formation took place already during the 1980s, total fertility rates in 1980–94 were considerably below the completed fertility among women born in 1960, who have realised most of their childbearing during this period (Bon-

gaarts 2002: 422). While the deficiencies of the total fertility approach have been well documented, there is no consensus on desirable alternatives, which would eliminate or minimise the distortions caused by the shifts in fertility timing (commonly denoted as ‘tempo effects’). If we disregard the most radical solution, namely, abandoning the use of indicators based on the *synthetic cohort* concept<sup>1</sup>, two broader approaches may be used. The first employs methods that try to provide an adjustment of the distorted fertility indicators. A number of adjustment procedures have been developed and discussed since 1998, when Bongaarts and Feeney proposed a simple formula for adjusting the total fertility rates (see, e.g., the methods proposed by Kohler and Philipov 2001, Kohler and Ortega 2002, Yamaguchi and Beppu 2004, and Bongaarts and Feeney 2005). The second approach employs period fertility indicators which are less affected by the shifts in fertility timing than the conventional total fertility. Although several alternatives to the TFR are known and occasionally used (see the overview by Rallu and Toulemon 1994 and Barkalov and Dorbritz 1996), they still remain relatively uncommon. In principle, a combination of these two approaches is possible as well.

The adjustment approach, especially the Bongaarts-Feeney method, has been used more frequently than the second approach (see Sobotka 2003 and 2004b for the Czech Republic and Slovakia). However, it has also been criticised for its potential shortcomings, namely for its simplifying assumptions (van Imhoff 2001) as well as considerable fluctuations in the resulting fertility indicators (Sobotka 2004b). A broad range of possibilities offered by the existing fertility indicators has not been fully explored yet, partly owing to the limited data availability.

This contribution constitutes an attempt to narrow this gap. It aims to illustrate the usefulness of two different sets of parity-specific indicators of period fertility for analysing trends in fertility tempo and quantum in times of substantial changes in the timing of childbearing. It focuses on period fertility in Austria, the Czech Republic, and Slovakia during the last two decades, especially after 1990, when an intensive postponement of childbearing has taken place in the Czech Republic and in Slovakia. The Czech Republic constitutes a particularly interesting case for this analysis: it has experienced a particularly pronounced shift towards later timing of family formation, but also a decline of the period TFR to one of the lowest levels in Europe, reaching below 1.2 in 1996–2003. If a large portion of the recent fall in the TFR in the Czech Republic and Slovakia occurred due to tempo distortions rather than due to the real changes in the underlying fertility quantum, the indicators presented here should reach considerably higher levels. In this case, a substantial reinterpretation of fertility trends as well as differences between countries may be necessary.

Both sets of indicators analysed here are parity-specific, i.e., they are constructed for each birth order separately. The first set is based on age-parity fertility model, whereas the second one analysis fertility rates by the duration since the last previous birth (birth interval approach). Thus, they reflect different philosophies about the

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<sup>1</sup> Synthetic cohort is a hypothetical cohort constructed on the basis of observed rates in a given period.

underlying parameters of fertility behaviour. They also reduce or eliminate the distortions present in the period TFR in two distinct ways. The age-parity model is unaffected by the distortions caused by the shifting parity composition of the population by age (*parity composition effect*), which may be very strong in the case of the period TFR for birth order 1. Duration-parity fertility rates are unaffected by tempo effects if the trend towards later timing of childbearing is primarily driven by the postponement of first births and the subsequent pace of childbearing remains relatively constant. The summary indicator of fertility is computed from the parity progression ratios. This procedure reflects the sequential nature of fertility behaviour and therefore comes closer in depicting correctly the underlying fertility patterns. It also enables to decompose the overall change in fertility into order-specific components.

The analysis presented here is partly motivated by the idea of fertility ‘postponement’ and subsequent ‘recuperation’. If the recent decline in total fertility rates has been partly attributable to the changes in fertility timing rather than to the ‘real’ decline in fertility level, this shift must be manifested by different developments of fertility rates at younger and older childbearing ages. To study this hypothesis and investigate whether women indeed ‘recuperate’ at least some of the presumably postponed births at later ages, it is equally important to analyse changes in fertility level and fertility timing. A more detailed description of the hypothesis of fertility postponement and recuperation is provided in the next section.

The main goals of this analysis may be summarised as follows:

1. To study changes in fertility level (quantum) in Austria, the Czech Republic, and Slovakia with the set of indicators that are parity-specific and minimise the influence of tempo distortions
2. To analyse recent shifts in fertility tempo and quantum, especially in the Czech Republic and Slovak Republic, within the framework of fertility postponement and recuperation
3. To compare the most recent parity-specific fertility patterns in the three analysed countries and outline main differences as well as commonalities, especially in relation to the convergence hypothesis

The article is structured as follows. The next part outlines the concept of fertility postponement and ‘recuperation’. The subsequent section provides an overview of data and methods used. The analytical part looks first at the trends in the age-parity indicators of fertility for first and second births, and at the evidence of fertility ‘recuperation’ at higher childbearing ages. Then it gives an overview of duration-based parity progression ratios and the summary indicator of period average parity. The final section summarizes main results and concludes.

## FERTILITY POSTPONEMENT AND RECOVERY: AN OUTLINE OF THE CONCEPT

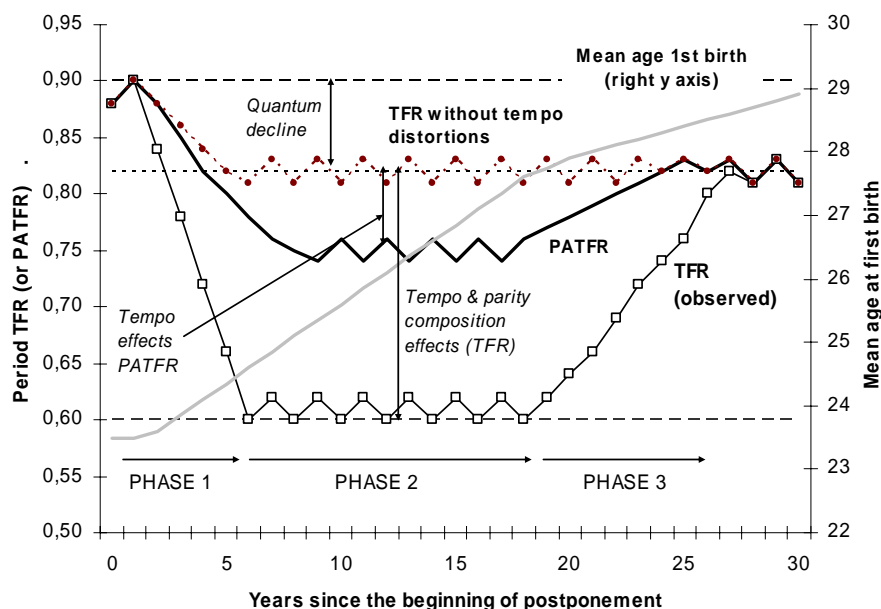
The idea of fertility postponement implies that a large part of the observed decline in the period total fertility rates is attributed to the shift in the timing of childbearing towards higher ages. This shift is manifested by a contrasting trend in fertility rates among younger and older women, which develops in a sequential fashion. First, fertility rates decline especially among young women, who put off motherhood towards the future. Later, at least some of these supposedly 'postponed' births are realised. As a result, parity-specific fertility rates increase, especially among women past age 30. As long as this shift continues, the TFR is negatively distorted and may remain at extremely low levels. Once the mean age of mothers at childbearing (especially at birth of the first child) stabilises, tempo distortions disappear and total fertility rates should eventually increase, although not necessarily back to the initial levels. The idea of fertility postponement and recuperation was first investigated within the cohort fertility framework (see Lesthaeghe 2001). Although cohort trends enable more precise analysis of the extent of fertility recuperation at later childbearing ages, period analysis may be more informative about the recent developments. The author has sketched out a concept of fertility postponement and recovery in a simplified model which outlines changes in fertility level and timing during this process (see Sobotka 2004b: 75–76). The main ideas and insights offered by this model are summarised below.

A comparison of fertility changes in different European countries suggests that there appears to be a sequence of fertility change during the shift towards later timing of childbearing, marked by an initial sudden decline in the period TFR (first phase), a prolonged period with a very low TFR level (second phase), and a subsequent 'catching up', bringing a significant increase in the TFR (third phase). The whole process of change lasts at least two decades, because any sudden change in fertility patterns brings also a shift in the parity structure of the female population by age and it takes at least 15 years for the TFR to reach the new equilibrium level implied by the actual set of age-parity fertility rates. The magnitude of the eventual 'recovery' in the TFR differs widely between countries, depending on the previous size of tempo distortions and also on the changes in the underlying fertility level during the period of postponement. Moreover, the recovery also varies by parity. Several theories as well as empirical evidence show that most women have a relatively strong motivation for motherhood (e.g., Foster 2001) and intended childlessness is not yet very widespread. Thus, the eventual recovery in fertility rates should be expected to be strongest in the case of first births. In addition, modern two-child family norm remains strong in many societies, suggesting that the potential 'catching up' in the TFR may be fairly pronounced at birth order two as well. On the other hand, recuperation in the total fertility may not materialise in the case of third or later birth orders. Higher-order fertility has shown a long-term declining trend in many societies and an ever later start of family formation does not allow many women to have three or more children due to the increase of infertility at late reproductive ages.

Figure 1 outlines a simplified model of fertility postponement and recovery progressing hand in hand with a moderate fertility decline. For simplification, the model focuses on first births. It assumes that the period of increasing mean age at first birth lasts 25 years. Such a long duration of fertility postponement is typical of contemporary European societies. In the absence of such postponement, the TFR would gradually decline from its initially high level around 0.9 to the new equilibrium around 0.8 (line denoted 'TFR without tempo distortions'). However, due to the rapid postponement of childbearing, represented by an increase in the mean age at first birth, the 'observed' TFR is deflated by tempo and parity composition effects, and within a short period declines to a much lower level around 0.6. It remains at this very low level for about 15 years. Once the intensity of an increase in the mean age at first birth slows down and eventually stops, tempo distortions decline as well, and with some delay, the parity composition effects gradually disappear as well. These diminishing distortions lead to gradual the recovery of the TFR to the new equilibrium level. Figure 1 also displays changes in the life-table indicator of first-order total fertility (PATFR), constructed from the set of age-specific first birth probabili-

**Fig. 1**

A simplified model of fertility postponement and recuperation: the case of first births



**Note:** This is a slightly modified version of Figure 3.13 in Sobotka (2004: 76)

ties. The PATFR reflects correctly exposure population and therefore is not affected by the parity composition effects. As a result, the PATFR does not decline so markedly below the new equilibrium level as does the TFR.

This model is a simplified representation of reality. Trends in fertility quantum may be changing frequently in many countries and the intensity of fertility postponement

may also fluctuate. The eventual extent of fertility recovery may greatly differ between countries and may fail to materialise in societies where the underlying fertility quantum continued to decline. At present, there are very few countries where fertility postponement has slowed down markedly or stopped and it is not possible yet to compare the outlined model with the empirical evidence. Furthermore, Ní Bhrolcháin and Toulemon (2005) have challenged the usefulness of the idea of fertility postponement for explaining and predicting trends in fertility rates. However, recent increase in the total fertility rate in several Western European countries, especially France and the Netherlands, was closely linked to the diminishing intensity of fertility postponement, and thus provides evidence supporting the outlined model. Furthermore, the model also fits well the long-term shift in the timing of family formation towards late reproductive ages, which was labelled by Kohler, Billari, and Ortega as a ‘postponement transition’. Insofar as the presented model provides a realistic representation of contemporary fertility change, it also constitutes a useful tool for fertility projection-making.

#### DATA & METHODS

Data from different sources have been combined to construct age-parity and duration-parity period fertility indicators and to estimate the composition of women by age and parity. Appendix 1 provides a list of data sources for each country.

The indicators based on age-parity fertility model (also called ‘fertility table’ indicators) are based on a set of age and parity-specific birth probabilities  $q_i(a)$  which are computed for each calendar year as follows:

$$q_i(a,t) = B_i(a,t) / P_{F,i-1}(a,T=January\ 1) \quad [1]$$

This equation expresses the probability that a woman aged  $a$  and having  $i-1$  children ( $P_{F,i-1}(a)$ ) at the beginning of the year will give birth during the year.  $B_i(a,t)$  is a number of live-born children of order  $i$  to women aged  $a$  realised during the year  $t$ . All computations are based on age reached during the year (cohort age).

The composition of the female population by age and parity was derived by combining the data on the number of live-born children, reported by the Population Census (data originate from the 1991 and 2001 Census in Austria and the 1980 Census in the Czech Republic and Slovakia), with age and order-specific fertility rates in the subsequent or the previous period. For each single age group  $a$ , an estimated proportion of women at parity  $i$  at the beginning of each calendar year (i.e., January 1) is denoted as  $w_i(a)$ . The number of women by age and parity is obtained by multiplying the relative proportion  $w_i(a)$  with the total number of women in a given age group  $P_F(a)$ . These estimates reflect correctly the real parity composition of the female population insofar as mortality and external migration do not substantially affect this composition. The procedure may give distorted results if women who migrate or die at each given age have a different number of children than the women who stay in the country and survive.

This contribution focuses mostly on the age-parity indicators for birth order 1, whereas the progression rates to the subsequent births are mostly derived from the duration-parity model. Consequently, an illustration of the computation of several indicators of fertility level and timing is provided here for first births. More detailed specification of the construction of various indicators based on the age-parity fertility model is provided in Park (1976), Rallu and Toulemon (1994) and Ortega and Kohler (2002).

The probability of giving birth in a specified age interval  $(a_1, a_2)$  for a woman still childless at the beginning of age  $a_1$  is computed as follows:

$$q_i(a_1, a_2) = 1 - \prod_{a_1}^{a_2-1} [1 - q_i(a)] \quad [2]$$

When the age interval  $(a_1, a_2)$  covers the whole reproductive period (by convention, ages 15 and 50 were selected here), this equation provides an index of total fertility for birth order 1, denoted as PATFR<sub>1</sub> (following Rallu and Toulemon 1994).

The set of age-parity birth probabilities in a given year may be organised within a framework of fertility table, which traces reproductive history of a synthetic cohort of 100,000 women, who are all childless at the beginning of the observation period (age 15). For every age category, the table lists the number of women still remaining childless (at parity 1, 2, etc.), the table number of births at each birth order  $(b_i(a))$ , the average exposure in person-years within each age interval, and selected other indicators (see Sobotka 2004b: 44–46 for an illustration of the construction of fertility table for first births in the Czech Republic in 2002). Indicators of fertility timing may be derived from the table number of births by age and birth order,  $b_i(a)$ .<sup>2</sup> For instance, the table indicator of the mean age at first birth ( $MAB_1^*$ ) is computed as a mean value of the age distribution of the number of births in fertility table for birth order 1:

$$MAB_1^* = \frac{\sum_a^{a \max} (b_1(a) \cdot a)}{\sum_a^{a \max} b_1(a)} \quad [3]$$

A similar procedure may be used to compute other indicators of fertility timing, such as median age, or the age when a selected proportion of women (10%, 25%, 75%, etc.) experiences first (second, third) birth.

Although in the case of first births fertility table indicators are less distorted by tempo effects and parity composition effects than the conventional TFR, it may be desirable to eliminate these distortions. For the overall quantum of fertility, pre-

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<sup>2</sup> It is, however, impossible to derive meaningful indicators of fertility timing from the schedule of age-parity birth probabilities, since such indicators might be strongly affected by outlying cases. First birth probabilities, for instance, may be high among the small group of childless women above age 35, which would push the mean age estimates derived from birth probabilities to an unreasonably high level.

sented here only for first births, both adjusted and unadjusted indicators are used in the analysis. The adjustment selected for this analysis is based on the method first proposed by Yamaguchi and Beppu (2004) and recently advocated by Bongaarts and Feeney (2005). Adjusted age-specific birth probabilities  $q(a)^*$  at each parity  $i$  are computed as follows:

$$q_i(a)^* = q_i(a) / (1-r_i) , \quad [4]$$

where  $r_i$  is a correction factor, derived from the estimated change in the mean age at childbearing of birth order  $i$  between the beginning and the end of year  $t$ :

$$r_i(t) = [MAB_i(t+1) - MAB_i(t-1)] / 2 , \quad [5]$$

where  $MAB_i$  is the mean age computed from the set of age and order-specific rates of the second kind ('incidence rates'). Thus, the adjustment procedure combines exposure-based indicators of fertility quantum with the indicators of fertility timing that are not exposure-specific (rates of the second kind). The adjusted index of total fertility for each birth order (adjPATFR<sub>*i*</sub>) is computed from the set of adjusted age-parity birth probabilities in the same way as the unadjusted index.

In the parity-duration framework, the transition rate between different parities is a function of the time elapsed since the previous birth. For each parity, a summary indicator combining fertility rates across all the birth intervals considered gives the period parity progression ratio (PPR). There are two different types of duration-parity indicators. The first one constitutes an analogous approach to the age-parity fertility model described above. It employs duration-parity birth probabilities based on the estimated distribution of the female population by the parity status and the year of birth of their last previous child for each calendar year considered. The second approach is based on duration-specific 'incidence rates' (rates of the second kind), which relate births of order  $i$  in the period  $t$  at duration  $d$  to the initial number of women who experienced birth of order  $i-1$  in the period  $t-d$ . This method is an analogy to duration-specific incidence rates, pioneered by L. Henry to analyse marital fertility (e.g., Henry 1953 and 1961). The 'exposure' is based solely on the time series of the total number of live births specified by birth order. Both methods were described by Rallu and Toulemon (1994), but remain scarcely used for analysing of fertility in advanced societies (see Ní Bhrolcháin 1987 for an analysis of marital fertility in England and Wales). Although the first approach is methodologically preferable, this article uses the second approach for the lack of detailed data to reconstruct the composition of the female population by the parity and duration from the previous birth (for Austria, both types of indicators have been constructed for 1999–2004; see Sobotka et al. 2005).

For birth orders 2 and higher, duration-specific rates of having a child of order  $i$  among women who had their  $(i-1)$ th child in a year  $y$  is computed as follows:

$$n_{i,d}(t) = B_{i,d}(t) / B_{i-1}(y) ; i \geq 2 ; t \geq y, \quad [6]$$

where  $B_{i-1}(y)$  is the total number of live-born children of order  $i-1$  reached in a year  $y$  and  $d$  indicates ‘duration,’ which is in this case simplified as a difference between the years when births of order  $i-1$  (year  $y$ ) and  $i$  (year  $t$ ) took place:  $d=t-y$ . The ‘duration’ indicator  $d$  ranged from 0 to 25; i.e. the earliest year of giving birth to a previous child (birth order  $i-1$ ) that was considered in our analysis was  $y(\min) = t-25$ .

The parity progression ratios ( $PPR_{i,i+1}$ ) were estimated for women at parities 1, 2, 3, 4, and the open-ended parity category 5+, reflecting the progression to 6<sup>th</sup> or higher-order birth among women with 5 or more children:

$$PPR_{i-1,i}(t) = \sum_{d=0}^{25} n_{i,d}(t) ; i \geq 2 \quad [7]$$

The incorporation of multiple births in this computation depended on the format of primary data obtained for each analysed country<sup>3</sup>. The potential bias resulting from these differences is small and implies above all a slight underestimation (by 1–2%) of the progression rates to a second birth in Austria.

A combination of the *PATFR* index for birth order 1 with the duration-based parity progression ratios gives the summary index of period fertility, which is called *period average parity (PAP)*. The *PAP* can be computed separately for each birth order  $j$  as follows:

$$PAP_j(t) = PATFR_1(t) \prod_{i=2}^j PPR_{i-1,i}(t) \quad [8]$$

The overall period average parity may be computed as a sum of the *PATFR* of birth order 1 and the *PAP* indexes for all the subsequent birth orders:

$$PAP = PATFR_1 + \sum_{j=2}^{j \max} PAP_j \quad [9]$$

The adjusted period average parity (*adjPAP*) is computed in the same way, with the first birth order component represented by the adjusted *PATFR*<sub>1</sub> index.

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<sup>3</sup> For Austria, second births resulting from a multiple delivery that involved also the first birth were not included. Higher-order births from multiple deliveries were included, but with an incorrectly imputed birth interval, referring to the last previous delivery rather than to the last previous birth (i.e., zero birth interval). More detailed information is provided in the Appendices to the article of Sobotka et al. (2005, p. 9). For the Czech Republic and Slovakia, all second and higher-order births resulting from multiple pregnancies have been included with a correctly imputed zero birth interval.

## ANALYSIS

### Trends in first and second births analysed with age-parity fertility indicators

This section provides an overview of changes in first and second birth patterns as depicted by different indicators based on age and parity-specific birth probabilities and the corresponding sets of period fertility tables.

**Fig. 2**

Age-specific probabilities of having a(nother) child among women at parity 0 and 1, 1990 and 2004

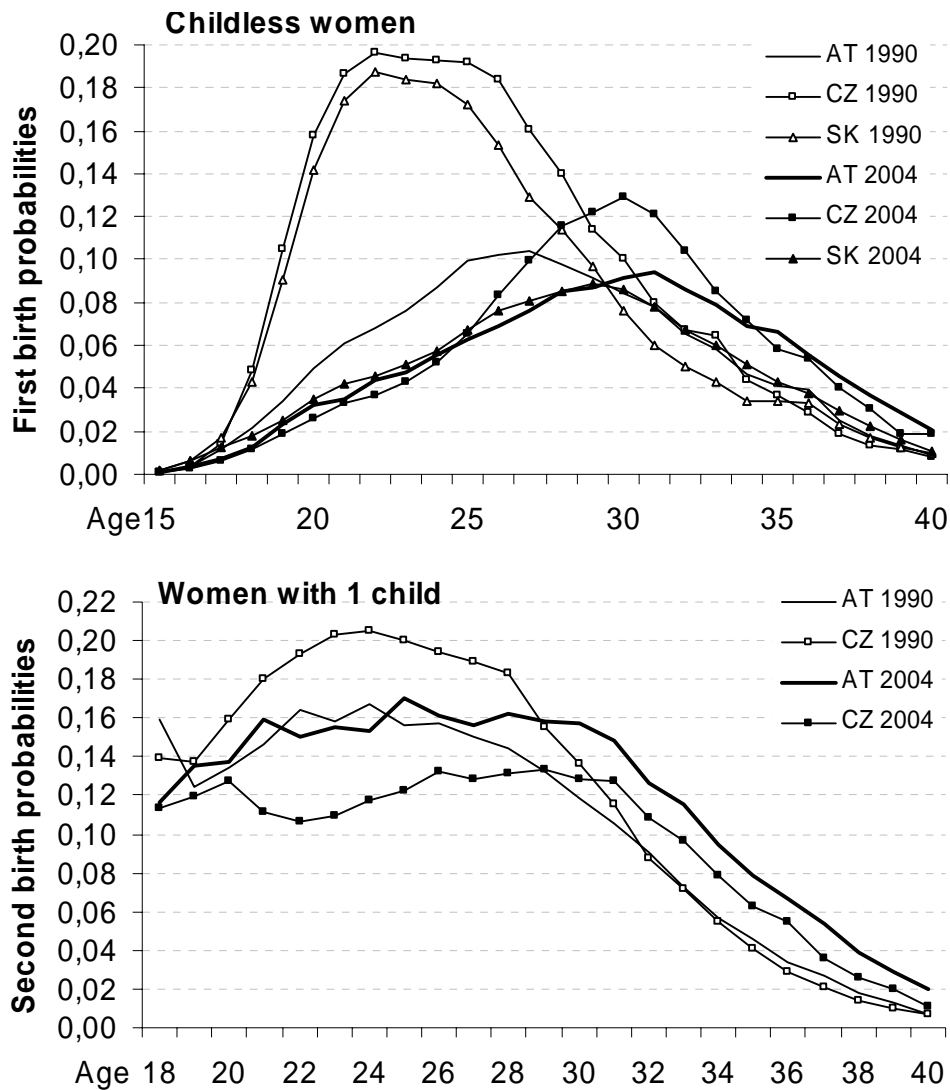
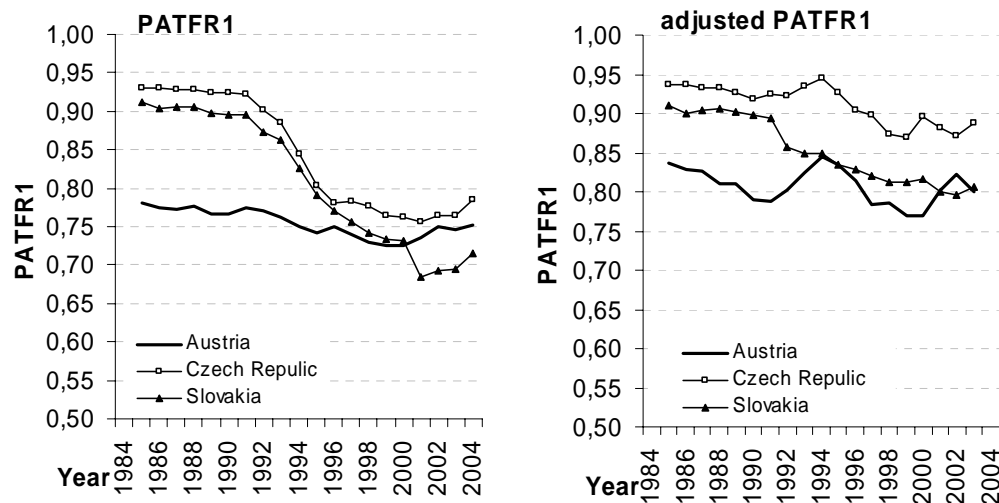


Figure 2 compares first and second birth probabilities by age in 1990 and 2004. Until recently, first births among Czech and Slovak women occurred at an early age

and motherhood was almost universal. Consequently, the schedule of first birth probabilities in the Czech Republic and Slovakia in 1990 strongly contrasted with the Austrian schedule. First birth intensity was slightly higher in the Czech Republic than in Slovakia and it was particularly high at ages 21–25. A decline in first birth intensity and a rapid postponement of motherhood has brought a profound transformation in the age patterns of first births in these countries. First birth probabilities have plummeted at younger ages, the pronounced peaks have levelled off and the age of highest first birth intensity has shifted to 28–30 in Slovakia, 29–31 in the Czech Republic, and 29–32 in Austria. There was a considerable convergence of Czech and Austrian first birth schedule at ages below 27 and above 33, whereas at ages 28–32 first birth intensity in the Czech Republic considerably surpasses the Austrian one. A rather different picture can be seen in a graph plotting the second birth probabilities, which compares Austria and the Czech Republic (these data were not computed for Slovakia). In Austria, second birth probabilities have remained relatively stable at younger ages and they have increased substantially among women past age 27, indicating a ‘catching-up’ of postponed second births. In the Czech Republic, second birth intensities surpassed the Austrian level at ages 22–28 in 1990, but thereafter they have fallen well below this level, especially at younger ages. A gradual increase in second birth probabilities is detectable there only among women aged 31 and older.

**Fig. 3**

The period PATFR index of birth order 1 (unadjusted and adjusted version), 1985–2004

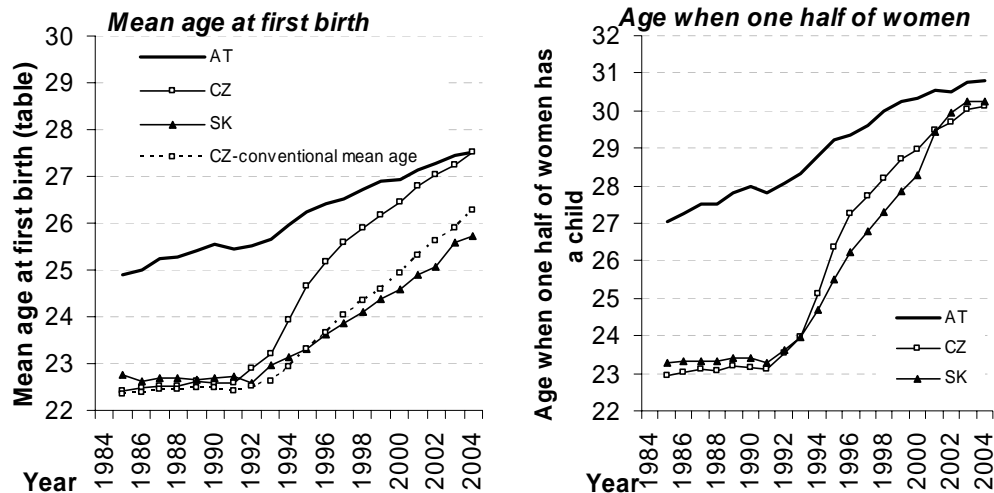


The overall intensity of first births is depicted in Figure 3, which plots the PATFR index of total fertility at birth order 1 and its adjusted version. These two graphs offer a different interpretation of first birth trends in the Czech Republic and Slovakia: whereas the PATFR suggests a pronounced decline in first birth intensity in both countries, the adjusted PATFR indicates that this decline has been less intensive, especially in the Czech Republic. Both indicators show that first birth intensity

has remained relatively stable in Austria, hovering around 0.80 when analysed with the adjusted PATFR. Czech women have retained the highest first birth intensity, with the adjusted PATFR increasing to the level of 0.89 in 2004. The decline in first birth rates has been more apparent in Slovakia, where the adjusted PATFR suggest a convergence to the Austrian level.

**Fig. 4**

Mean age at first birth and age when one half of women become mothers, 1985–2004 (fertility table indicators)



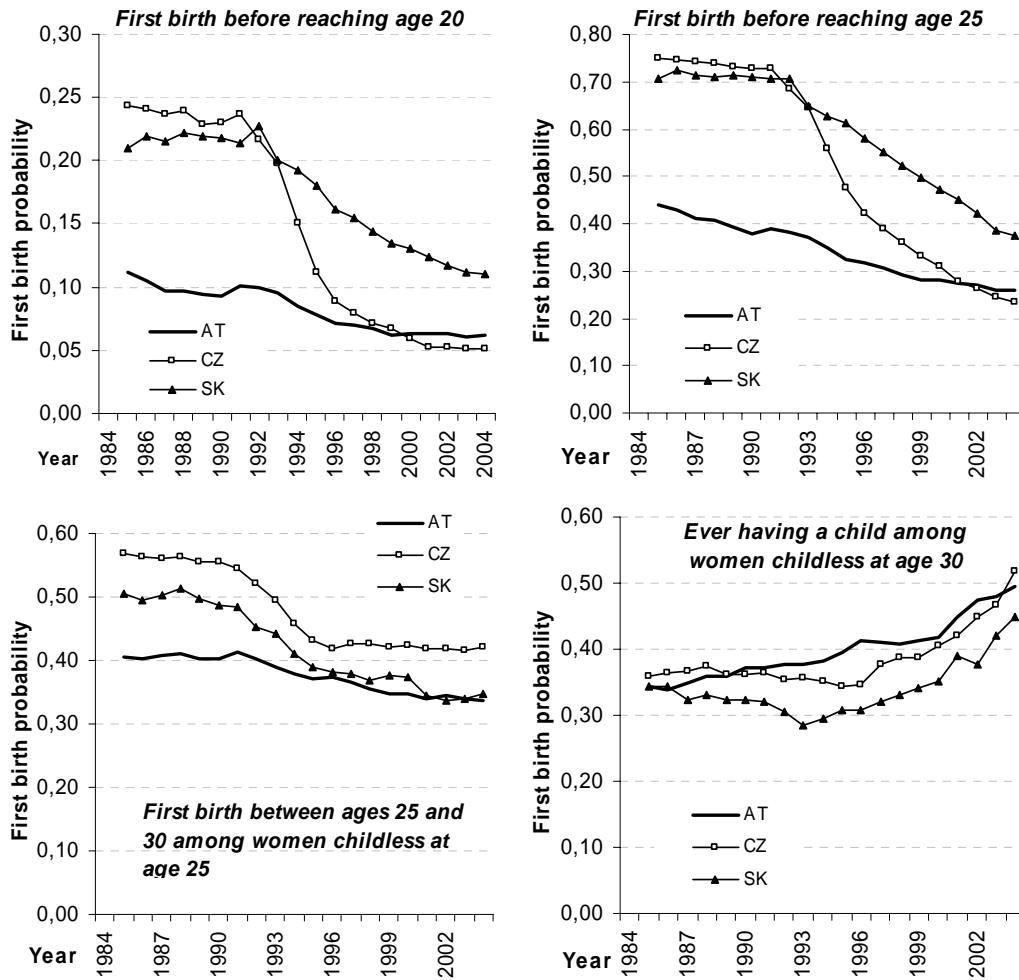
The difference between the PATFR and its adjusted counterpart signals an intensive postponement of first birth, especially in the Czech and Slovak Republics. Figure 4 features two different indicators of first birth timing based on the period fertility tables: mean age at first birth and the age when one half of women enter motherhood. The delay of family formation has been relatively intensive in all three societies, but especially so in the Czech Republic, which has experienced one of the most pronounced shifts in fertility timing documented in contemporary Europe. Fertility table indicates that the mean age of mother at birth of first child in the Czech Republic has increased by five years from the low value of 22.6 in 1991 and has converged to the Austrian level of 27.5 years in 2004. This table indicator shows more pronounced increase than the conventional mean age at first birth, computed from the schedule of first birth ‘incidence rates’ (rates of the second kind), which is illustrated in Figure 4 on the example of the Czech Republic. The measures based on fertility table are unaffected by the initially younger composition of childless women in the population than would correspond to the actual first birth patterns and thus reveal better the real magnitude of shift if first birth timing (see also Sobotka 2004b, Chapter 3). The change in the age when one half of all women become mothers combines the effects of progressively delayed childbearing and declining first birth intensity. As a result, this shift is even more pronounced than the shift in the mean age at first birth. Whereas in 1990 around one half of Czech and Slovak women

became mothers shortly after reaching age 23, i.e., by almost five years sooner than Austrian women, this indicator has recently converged to age 30–31 in all three countries.

**Fig. 5**

Changes in first birth patterns among women at selected ages (fertility table indicators), 1985–2004:

- a) Probability of having first child before reaching age 20
- b) Probability of having first child before reaching age 25
- c) Probability of having first child between ages 25 and 30 among women childless at age 25
- d) Probability of ever having a child among women remaining childless at age 30



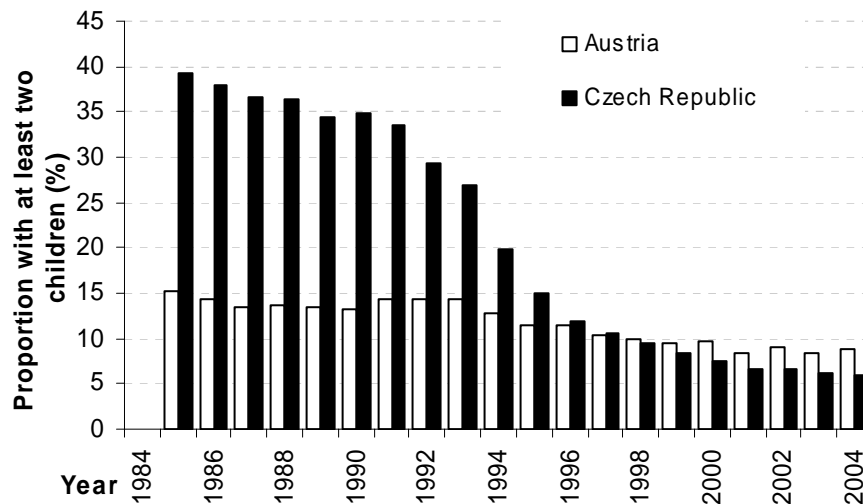
Additional evidence on the recent shifts in first birth patterns is provided by the graphs of first birth probabilities at selected age intervals, featured in Figure 5. Austria has experienced relatively stable trend of a gradual decline in first birth intensity among women below age 30 and a counterbalancing increase among the ‘older’

childless women. Worth noting is a recent stabilisation in first birth intensity among teenage women, and, most recently also at ages 25–30. In contrast to Austria, women in the Czech Republic and, to a smaller extent also in Slovakia, have dramatically changed their reproductive behaviour. Among Czech women, the probability of having first child as a teenager declined by almost four-fifths, from 0.24 in 1990 to 0.05 in 2004, which is below the level of 0.06 recorded in Austria. Similarly, the probability of having a child by the age of 25 has also dropped below the Austrian level, from 0.75 to 0.23. On the other hand, the probability of having a child between ages 25 and 30 (conditional on being childless at age 25) has stabilised above the Austrian level and the probability of ever having a child among women childless at age of 30 has increased rapidly, reaching above 0.50 and surpassing the Austrian level in 2004. Thus, the Czech Republic provides not only an example of a drastic decline in first birth intensity at younger ages, but also of strong recuperation of first births at higher ages.

The shift in the patterns of family formation has also strongly affected the proportion of women who have two or more children at younger ages. Fertility patterns of the mid-1980s implied that almost 40% of Czech women would have two or more children at age 25 as compared with 15% in Austria (see Figure 6, this indicator was not computed for Slovakia). In both countries, it declined to about 10% in 1997. The most recent set of age-parity birth probabilities implies that only 6% of Czech women and 9% of Austrian women would reach the most common ideal family size of two children by the age of 25.

**Fig. 6**

Proportion of women having two or more children at age 25 based on the period fertility table. Austria and the Czech Republic; 1985–2004

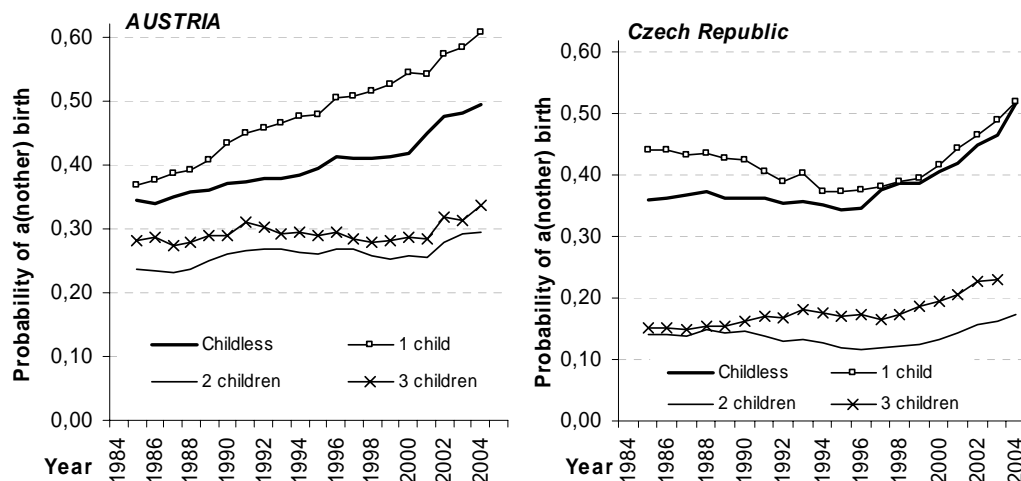


### Fertility 'recuperation' at higher ages: trends in age-parity fertility above age 30

The results obtained in the previous section have shown an increasing intensity of first births after age 30. Figure 7 points out that the development of conditional birth probabilities among Austrian and Czech women after age 30 has been differentiated by parity. In Austria, women with one child have the most pronounced tendency to have another child later in live: the progression rate to the second birth after age 30 has increased steadily in the last two decades and has considerably surpassed the first birth progression rates. If the most recent fertility patterns were to prevail, more than 60% of Austrian women with one child by age 30 would eventually have another child, up from 37% in 1985, and one half of childless women would eventually become mothers after that age. Women in the Czech Republic also show a clear tendency to 'catch up' their delayed first and second births, although this process has begun more recently due to the later start of fertility postponement and was preceded by a decline in second birth intensities at higher ages. According to the most recent patterns, more than one half of Czech women who are of parity 0 or 1 by the age of 30 would eventually have a(nother) child, up from 35–37% in the mid-1990s. There has been only a very limited increase in the intensity of late childbearing among Czech women with 2 children, indicating a widespread 'stopping rule' after two births. In contrast, women with three children have recently shown a stronger tendency to have a fourth birth at later ages.

**Fig. 7**

Conditional period probability of ever having a(nother) child by parity status at age 30; women in Austria and the Czech Republic, 1985–2004



Is a similar trend of an increasing birth intensity also detected at the late and very late childbearing ages, namely after the ages of 35 and 40? Figure 8 shows that an increase in the frequency of very late childbearing is even more pronounced, especially in Austria, where the process of first birth postponement began already in the early 1980s. In the mid-1980s, Austrian and Czech women of parity 0 and 1 had an equal probability of having a(nother) child after age 35, implying that around one-

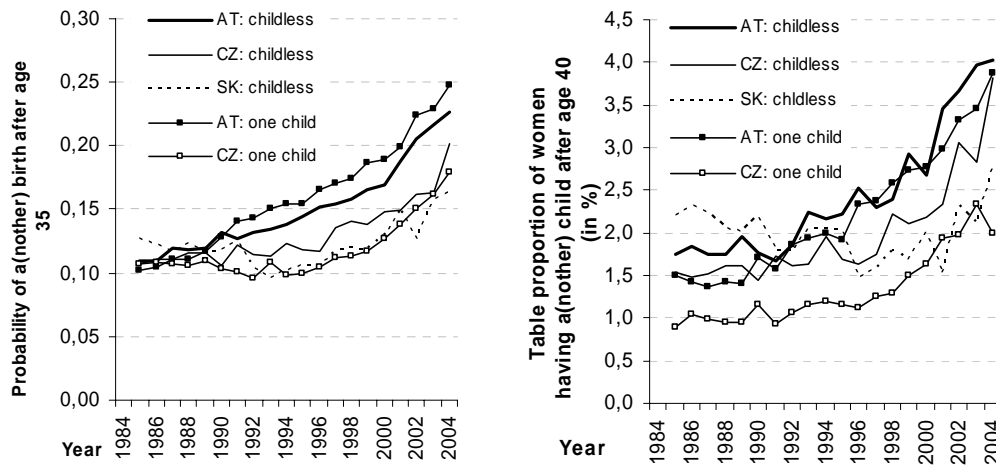
tenth would eventually experience an increase in their family size. In 2004, Austrian women with one child show the strongest tendency of ‘catching up’ after age 35, with one quarter eventually having a second child. In the Czech Republic, childless women have the highest probability of progressing to another parity after age 35, which has reached 20% in 2004. Similarly, a substantial increase in childbearing intensity can be observed among women past age 40. Although the conditional probability of having a child still remains very low at this age, the recent increase has been impressive. Fertility tables for 2004 indicate that around 4% Austrian women of parity 0 and 1 and Czech women of parity 0 at age 40 would eventually have another child; this proportion was close to 1.5% in the mid-1980s.

**Fig. 8**

Conditional progression rate to a(nother) child after age 35 and 40 among Czech and Austrian women at parity 0 and 1 (1985–2004)

a) Conditional period probability of having a(nother) child after age 35

b) Conditional proportion of women having a(nother) child after age 40



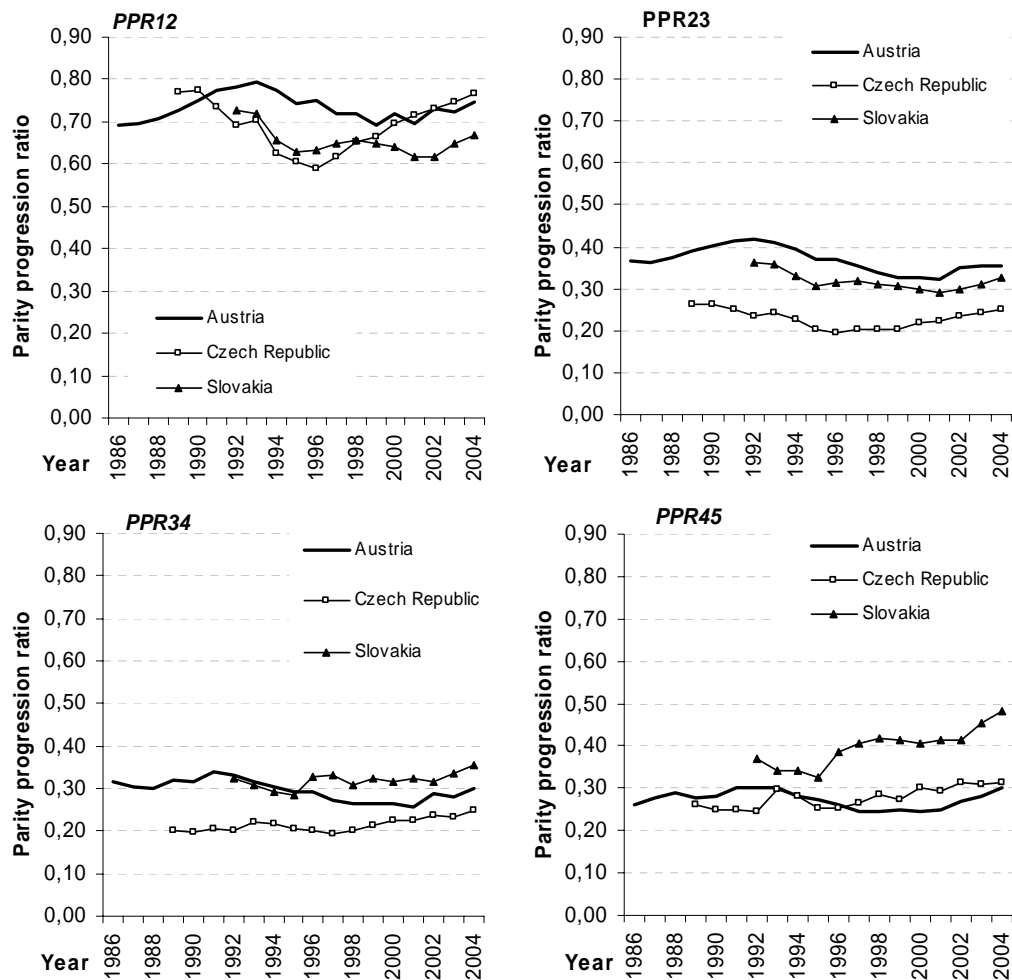
### Parity-progression ratios (duration-parity indicators)

Duration-specific parity progression ratios reveal a persistent popularity of a two-child family model in the analysed countries (Figure 9). This pattern is most pronounced in the Czech Republic, where the recent progression rate to the second birth reached above 0.75, whereas the progression rate to the third birth remains at one-third of this level (0.25), and considerably below the level recorded in Slovakia (0.33) and Austria (0.36) in 2004. The Czech Republic and Slovakia experienced a decline in the second birth progression rates during the first half of the 1990s, but this trend has been later reversed in the Czech Republic. A comparison of recent trends in parity progression ratios reveals several differences, most of which persist over longer periods of time. Czech and Austrian women have a fairly high progression rate to the second birth, which is relatively stable in the case of Austria (see

also Sobotka 2005). Thus, the long-standing postponement of family formation among Austrian women has not, at least in an aggregate perspective, affected their ability to have a second child. Austrian women also have the highest progression rate to the third birth. Slovak women, on the other hand, have a fairly low progression rate to the second and third birth, but they have an elevated fourth birth progression rate and a high and increasing progression rate to the fifth birth. This pattern is probably explained by an increasing selectivity of a shrinking group of women who progress to parity three or higher. Many of them probably belong to the Roma minority, which is still characterised by high fertility rates (Vaňo 2001).

**Fig. 9**

Parity progression ratios for women at parity 1, 2, 3, and 4 in 1986–2004 (duration-parity indicators)

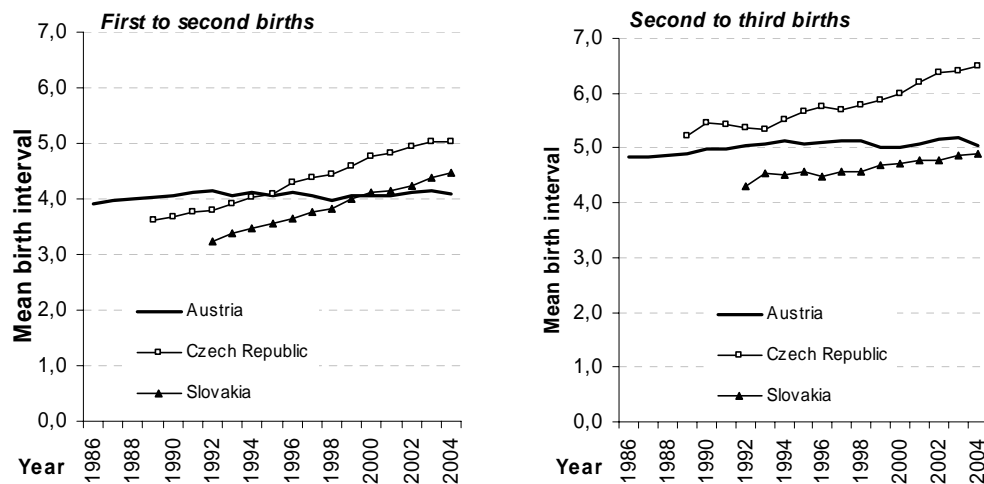


The idea that duration-based indicators depict correctly the underlying level of fertility hinges upon the assumption of stability in the mean birth intervals. Figure 10

features trends in the mean birth intervals for second and third births. Obviously, birth intervals have been remarkably stable only in the case of Austria. In the Czech Republic and Slovakia, childbearing has been postponed not only among childless women, but also among women with one or two children. Especially women with one child wait increasingly longer before they decide to have another one: the mean second birth interval has risen from 3.6 years in 1989 to 5.0 years in 2004, i.e., one year above the Austrian level. A similarly intensive increase has been observed in Slovakia. In all three analysed countries, third birth intervals are higher than the second birth intervals and reach the highest value, 6.5 years, in the Czech Republic (up from 5.2 years in 1989). It is unclear to what extent social and family policies in each country contribute to these trends and differences. The observed postponement of second and third births in the Czech Republic and Slovakia indicates that the parity progression rates have been negatively distorted and would probably reach higher levels in the absence of this postponement. This finding also suggests that the steep decline and the subsequent rise in second birth progression rates in the Czech Republic has been partly driven by tempo effects.

**Fig. 10**

Mean birth intervals for the second and third births, 1986–2004 (duration-parity indicators)



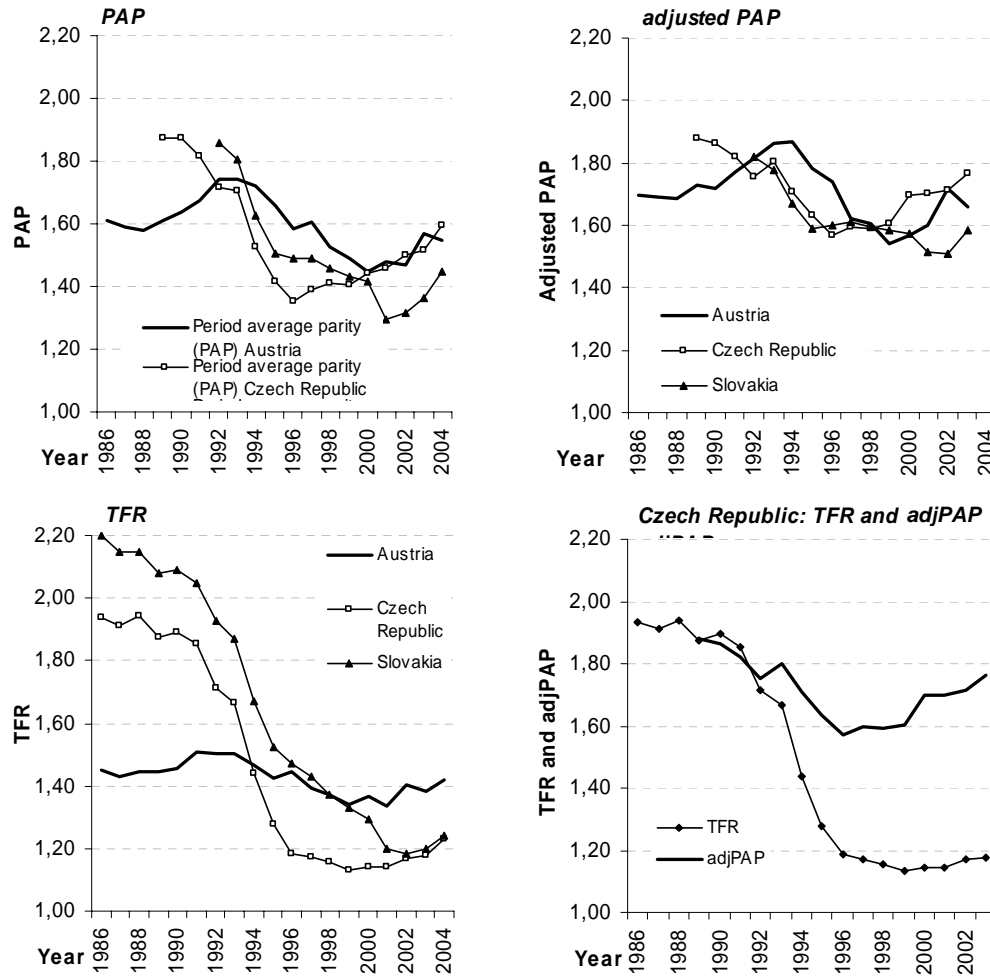
### The period average parity

The period average parity (PAP) combines two different indicators analysed in the previous section: the PATFR index for birth order 1 and the parity progression ratios for the subsequent births. The ‘ordinary’ PAP is presented in Figure 11 alongside its adjusted counterpart (adjPAP), which is based on the adjusted PATFR for birth order one (see Figure 3 above). We discuss these indicators on the backdrop of the conventional total fertility rates. In all three countries, the period average parity shows substantially higher levels of fertility than the total fertility rates. This contrast has been relatively stable during the last two decades in Austria, where the TFR has hovered around 1.4, whereas the PAP has fluctuated around 1.6 and the adjusted

PAP around 1.7. A sharp divergence has occurred recently between the PAP and the TFR trends in the Czech Republic and Slovakia. Until the mid-1990s, the PAP, the adjPAP, as well as the TFR had been declining in both countries. Subsequently, the PAP depicted an increasing trend in the Czech Republic, whereas the TFR had further declined and subsequently stabilised at an extremely low level below 1.2. Slovakia appears to be on a similar track, albeit with a time lag of about five years.

**Fig. 11**

Period average parity (unadjusted and adjusted) and the total fertility rate, 1986–2004



The marked divergence between the TFR and the adjusted PAP in the case of the Czech Republic is shown in the last graph in Figure 11. It looks as if there are two completely different stories on period fertility trends at hand: one of a drastic fall of fertility rates to the extremely low levels and another of a fertility decline to relatively low levels and a subsequent gradual increase. A similar, although less polarised, picture, emerges for Slovakia as well. In the light of the detailed evidence on

parity-specific changes in period fertility presented above, the adjusted PAP provides considerably more accurate picture of trends in the underlying fertility quantum. Thus, we may conclude that period fertility, as captured by the PAP, has not declined to the ‘lowest-low’ level in any of the analysed countries. Furthermore, there seems to be a general convergence towards low, but not very low, fertility level in these countries. In 2002–2003, the adjusted PAP was lowest in Slovakia (1.54) and somewhat higher in Austria (1.69) and the Czech Republic (1.74). It is worth noting that the Czech Republic had the lowest TFR level (1.16), but the highest adjPAP level during this period. This evidence again points out to the strong intensity of fertility postponement there and, subsequently, to the sheer extent of tempo distortions and parity composition distortions in total fertility rates.

## SUMMARY AND CONCLUSIONS

The parity-specific analysis presented in this article offers a vastly different portrait of fertility levels and trends in Austria, the Czech Republic, and Slovakia than the commonly used fertility indicators. Table 1 summarises the main features of recent fertility patterns in these three societies in 2002–2003.<sup>4</sup> Parity-specific indicators based on birth interval distributions show that the underlying fertility level remains well above the total fertility rates, especially in the case of the Czech Republic and Slovakia. In both countries, period fertility, as measured by the adjusted PAP index, declined during the 1990s and remains well below the replacement level threshold (around 2.08 children per woman), but it did not reach extremely low levels indicated by the total fertility rates. In comparison with the Czech Republic and Slovakia, Austria has been characterised by relatively stable fertility during the last two decades, marked by moderate fluctuations, and gradual postponement of childbearing. The analysed countries have experienced a general trend towards convergence in the overall fertility level and in the timing of family formation. Nevertheless, several contrasts characterise their parity-specific fertility patterns.

**Table 1**

Parity-specific fertility indicators for Austria, the Czech Republic, and Slovakia in 2002–2003

	Parity progression ratios					Mean age 1 <sup>st</sup> birth and mean birth intervals			Indexes of total fertility	
	adjPPR <sub>01</sub>	PPR <sub>12</sub>	PPR <sub>23</sub>	PPR <sub>34</sub>	PPR <sub>45</sub>	MAB <sub>1</sub>	BI <sub>12</sub>	BI <sub>34</sub>	adjPAP	TFR
Austria	0.81	0.73	<b>0.35</b>	0.28	0.27	<b>27.37</b>	4.13	5.17	1.69	<b>1.37</b>
Czech Republic	<b>0.88</b>	<b>0.74</b>	0.24	0.23	0.31	27.15	<b>4.98</b>	<b>6.38</b>	<b>1.74</b>	1.16
Slovakia	0.80	0.63	0.30	<b>0.33</b>	<b>0.43</b>	25.33	4.31	4.81	1.55	1.19

**Note:** Highest value of each indicator is printed in bold

Women in the Czech Republic retain relatively high first birth rates, but they have very low progression rate to the third birth, which is considerably higher among

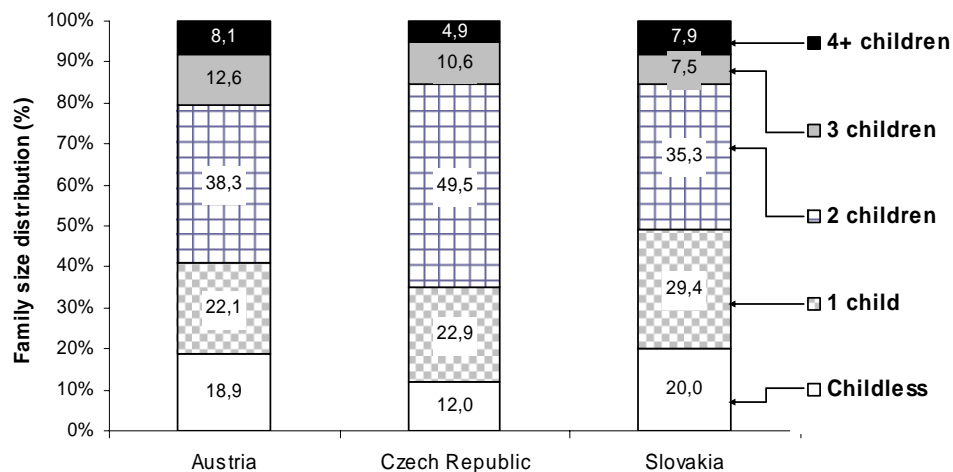
<sup>4</sup> Because the adjusted indicators could not be computed for the most recent year (2004), we summarise the results for 2002–2003 to ensure comparability of the data.

Austrian women. In contrast, Slovak women have low second birth rate combined with an elevated rate to the fourth and fifth birth. Slovak women form family at a younger age than Czech and Austrian women, while Czech women have progressively postponed not only the birth of their first child, but also of their second and third children.

Figure 12 features a hypothetical family size composition which would result from the recent parity-specific trends, if they were to prevail over a long period of time. Austrian women would have the highest share of larger families (21% would have 3 or more children), Czech women stand out for a high proportion of families with two children (50%) and a relatively low childlessness (12%), whereas Slovak women would have a fairly high share of families with one child (29%). These findings are in agreement with some long-standing fertility patterns in these countries, such as a strong orientation towards a two-child family model in the Czech Republic and a higher proportion of larger families in Austria. In Slovakia, however, they constitute a departure from the previous family model, and imply a pronounced increase in childlessness as well as in the proportion of one child families on account of a declining proportion of women with two or more children. It remains to be seen whether this is a temporary trend or a real shift in family patterns, which would be later translated into a similar shift in cohort fertility.

**Fig. 12**

Family size composition implied by the parity-specific fertility patterns in 2002–2003



The vast contrast between the recent trends in total fertility rates and the period average parity signals a need for a reinterpretation of fertility changes in the Czech Republic and Slovakia during the last 15 years. Table 2 decomposes parity-specific fertility changes between the early 1990s and 2002–03. In the Czech Republic, a modest decline in the first, second, and third birth progression rates in the order of

4–8% resulted in a reduction of the adjusted PAP from 1.87 to 1.74. In contrast, the TFR fell by almost 40%, from 1.89 to 1.16 during this period. Slovakia has experienced a relatively strong decline in the progression rate to the second and third birth (by 13 and 16%, respectively) and a modest decline in first birth progression rate. As a result, the adjPAP declined by 15% during this period, from 1.82 to 1.55, whereas the TFR declined by a similar magnitude as in the Czech Republic, from 1.93 to 1.19.

**Table 2**

Decomposition of parity-specific changes in fertility in the Czech Republic and Slovakia between the early 1990s and 2002–03

	Parity progression ratios				Mean age 1 <sup>st</sup> birth and mean birth intervals			Indexes of total fertility	
	adjPPR <sub>01</sub>	PPR <sub>12</sub>	PPR <sub>23</sub>	PPR <sub>34</sub>	MAB <sub>1</sub>	BI <sub>12</sub>	BI <sub>34</sub>	adjPAP	TFR
<b>Czech Republic</b>									
1990 (1)	0.918	0.776	0.261	0.199	22.60	3.66	5.45	1.865	1.893
2002–03 (2)	0.880	0.740	0.239	0.234	27.15	4.98	6.38	1.738	1.156
Relative change (2)/(1)	<i>0.958</i>	<i>0.953</i>	<i>0.916</i>	<i>1.177</i>				<i>0.932</i>	<i>0.611</i>
Absolute change (2)-(1)	<i>-0.038</i>	<i>-0.036</i>	<i>-0.022</i>	<i>0.035</i>	<i>4.55</i>	<i>1.32</i>	<i>0.93</i>	<i>-0.127</i>	<i>-0.737</i>
<b>Slovak Republic</b>									
1992 (1)	0.856	0.729	0.363	0.323	22.60	3.23	4.31	1.821	1.930
2002–03 (2)	0.800	0.633	0.304	0.327	25.33	4.31	4.81	1.546	1.193
Relative change (2)/(1)	<i>0.935</i>	<i>0.869</i>	<i>0.838</i>	<i>1.011</i>				<i>0.849</i>	<i>0.618</i>
Absolute change (2)-(1)	<i>-0.056</i>	<i>-0.096</i>	<i>-0.059</i>	<i>0.004</i>	<i>2.73</i>	<i>1.08</i>	<i>0.50</i>	<i>-0.275</i>	<i>-0.737</i>

This overview suggests that the Czech Republic has not experienced a dramatic decline in fertility level, but rather a dramatic shift in fertility timing, which has strongly affected all the usual indicators of period fertility. This hypothesis is further supported by the findings provided by the adjusted total fertility rates (e.g., Sobotka 2003 and 2004b) and also by the cumulated progression rates to another birth computed for the parity cohorts (see Koschin 2003 and the analysis presented elsewhere in this monograph). The life table indicators show that the start of family formation among Czech women has been delayed by about 5 years since the early 1990s and has reached the Austrian level. Among younger women a drastic reduction of first birth intensity took place, which was later followed by an increase in the intensity of childbearing at higher ages. This development fits well the idea of a ‘postponement transition’ from an early to a late pattern of family formation, proposed by Kohler, Billari, and Ortega (2002). Comparable trends have been also recorded in Slovakia, but with a lower intensity and a time lag of several years. Alongside Slovenia, Czech Republic has seen the most intensive postponement of first births in contemporary Europe. Thus, the analysis of fertility change in the Czech Republic is of an immense interest also from the theoretical and methodological perspective.

The findings presented in the analytical part provide a tentative support for the ‘re-cuperation’ hypothesis. The ‘catching up’ of delayed childbearing past age 30 is most intensive in the case of first births in the Czech Republic and second births in

Austria. There are some signs that this 'recovery' is being translated into a rising trend in the period TFR in the Czech Republic and Slovakia in the most recent period, but a substantial increase in total fertility close to the levels of the adjusted PAP cannot be expected to materialise soon. Not only because fertility quantum may further decline in the future, but especially because the trend towards later childbearing is likely to continue, although with a lower intensity. All three societies are still far away from the age limits to late childbearing and have a younger pattern of family formation than the countries of Northern and Southern Europe. Furthermore, a continuing expansion of high education, especially in the Czech Republic and Slovakia, suggests that first births will be further postponed in the future, as many highly educated women enter family at late reproductive ages. These observations have also considerable relevance for fertility projections. For the near future, a modest increase in the total fertility rates may be expected in the Czech Republic and Slovakia. This would be linked to the slowing down in the intensity of fertility postponement rather than to the 'real' increase in fertility quantum. In the more distant future, these two countries have a potential for a more substantial rise in the TFR, related to the eventual ending of fertility postponement, whereas in Austria a modest increase may be envisioned. However, it is impossible to predict when the shift towards later childbearing may come to an end.

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## APPENDIX 1: LIST OF DATA SOURCES FOR INDIVIDUAL COUNTRIES

Data from different sources have been combined to construct age-parity and duration-parity period fertility indicators as well as the composition of women by age and parity, which was necessary for computing the former set of indicators. Appendix 1 provides a list of data sources for each country.

### **1. Austria**

Data on live births by birth order and age of mother in 1985–2004 provided by Statistics Austria;

Data on age and parity composition of the female population recorded by the 1991 Census (Statistics Austria 1996) and the 2001 Census (Statistics Austria 2005);

Data on age structure of the female population in 1985–2004: Eurostat (2005);

Data on total live births by birth order in 1960–1983: Author's estimates based on the 1981 Census (Statistics Austria 1989) and the recorded live births in 1984–85 (an approximation was used for the period 1981–83);

Data on live births by birth order and the year of the last previous birth in 1985–2004 were derived from the database of births provided by Statistics Austria.

### **2. Czech Republic**

Data on live births by birth order and age of mother in 1989–1999 were provided by the Czech Statistical Office, Prague. Data for 1985–1988 are based on FSU (1986–1989), data for 2000–2003 are based on Eurostat (2005), data for 2004 are based on CSU (2005);

Data on age and parity composition of the female population recorded by the 1980 Census (FSU 1982);

Data on age structure of the female population in 1985–2004: Eurostat (2005);

Data on total live births by birth order in 1960–1990: Council of Europe (2005);

Data on live births by birth order and the year of the last previous birth in 1989–2004 were obtained from the Czech Statistical Office, Prague.

### **3. Slovak Republic**

Data on live births by birth order and age of mother in 1989–1998 were provided by the Slovak Statistical Office and Infostat. Data for 1985–1988 are based on FSU (1986b–1989b), data for 1999–2003 are based on Eurostat (2005), data for 2004 were provided by Infostat;

Data on age and parity composition of the female population recorded by the 1980 Census (FSU 1982b);

Data on age structure of the female population in 1985–2004: Eurostat (2005);

Data on total live births by birth order in 1960–1990: Council of Europe (2005);

Data on live births by birth order and the year of the last previous birth in 1992–2004 were obtained from Infostat