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Tomas Frejka

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Abstract

Quantum and tempo effects in shaping total period fertility rate (TPFR) trends have been thoroughly investigated in the literature. An analysis of the effect of the overlap of changing cohort childbearing patterns of successive cohorts on TPFRs, which so far has been overlooked, is the focus of this paper. The fertility history of Western countries, Southern Europe, Central and Eastern Europe, and of East Asia during the past half century is analyzed in the light of this relationship. Our research concludes that period fertility descents and troughs, for instance, "lowest-low" fertility, as well as increases and peaks are predominantly the outcome of changing cohort childbearing patterns due to fertility postponement and recuperation combined with overlays of successive birth cohorts. Period fertility troughs occurred in Western countries during the 1980s, in Central and Eastern Europe around 2000. TPFR increases in the early 21st century are largely generated by relatively high numbers of recuperated births in older birth cohorts outweighing smaller numbers of births among young women in overlaying younger cohorts. By elaborating on the mechanisms of interacting fertility trends of age groups of overlapping birth cohorts over time these empirical investigations are thus an extension and a complement to the findings and conclusions of Bongaarts and Feeney (1998, 2006 and Bongaarts 2002).

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The massive postponement and recuperation of childbearing have been important sociological and demographic developments during the past half century[1]. Changing childbearing age patterns have been integral components in the evolution of family formation, the diversity of marriage and cohabitation forms and trends, and the "Second Demographic Transition" (Billari 2008; Billari and Kohler 2004; Bongaarts and Feeney 1998; Castles 2003; Frejka et al. (eds.) 2008; Frejka et al. 2010; Frejka and Sardon 2004; Goldstein et al. 2003; Goldstein et al. 2009; Jones et al. 2009; Kohler at al. 2002; Konietzka and Kreyenfeld (eds.) 2007; Lesthaeghe 1995 and 2001; Lesthaeghe and Neidert 2006; Lesthaeghe and van de Kaa 1986; Lutz and Skirbekk 2005; McDonald 2002, 2006 a and b; Sobotka 2003, 2004 a and b; Sobotka and Toulemon 2008).

Considerable attention has been devoted to the effects of quantum and tempo changes on period fertility trends (for instance, Bongaarts and Feeney 1998; Goldstein et al. 2009; Hajnal 1947; Kohler et al. 2002; Lesthaeghe 2001; Lutz and Skirbekk 2005; Ryder 1964; Sobotka 2003; and others). Thus far, however, the effect of the overlay of age patterns of cohort fertility of successive cohorts as well as the duration of the postponement and recuperation process on trends of total period fertility rates have rarely been analyzed, demonstrated and documented[2].

Research reported on in this paper explores the detailed age-specific mechanisms, the interaction of fertility trends of age groups, in particular between young and older women of overlapping birth cohorts, which underlie trends in total period fertility rates in 36 low fertility countries. Thus it reveals another aspect of the importance of changing childbearing patterns during the past half century. The overlay of changing childbearing patterns in successive birth cohorts over time has an instrumental effect in shaping period fertility levels and trends. Also

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[1] On average in all low fertility countries the cumulative cohort fertility rate up to age 27 was 1.3 births per woman in the 1940 birth cohort. It declined to 0.5 births per woman in the 1980 birth cohort (Frejka and Sardon 2009: Table 6 and Appendix 3).

[2] Frejka (2008:157) briefly discussed the role of birth cohort overlay in generating "lowest-low" fertility. In the context of analyzing family formation and childbearing during the 1990s societal transition in Central and Eastern Europe he noted:

> "The varying childbearing behaviour of the respective cohorts is a crucial circumstance contributing to the very low fertility rates of the mid- to late 1990s and early 2000s. The birth cohorts of the 1950s and early 1960s had essentially completed their childbearing by that time. Almost all of their children had been born by the early 1990s. On the other hand, many potential parents of the cohorts born during the 1970s and early 1980s were delaying childbearing until their late twenties or early thirties, and thus were not bearing many children during the mid- to late 1990s. Because the former cohorts were no longer having children in the mid- to late 1990s, and the latter cohorts were just gradually starting their childbearing, period fertility was at its lowest."

the length of time for which the postponement and recuperation process lasts is directly linked to the overlay of cohort childbearing age patterns and has a notable effect on trends of total period fertility rates.

By elaborating on the mechanisms of interacting fertility trends of age groups of overlapping birth cohorts over time these empirical investigations are thus an extension and a complement to the findings and conclusions of Bongaarts and Feeney (1998, 2006 and Bongaarts 2002).

The present time is suitable and favorable for a detailed empirical investigation of the postponement and recuperation process in low fertility countries. This process has been in progress in many of these countries over the past 40 to 50 years and data to conduct the research are available. The process first started in the United States during the 1960s, its beginnings spread to other Western countries and Japan in the 1970s, in the 1980s it started in countries of Southern Europe, and the countries of Central and Eastern Europe have experienced this process since the 1980s and early 1990s. For various reasons it is difficult to assess when childbearing postponement started in low fertility East Asian countries however clearly it has been in progress for at least two decades or so. The availability of sufficiently long series of detailed single-year age-specific fertility rates in the data bank of the Observatoire Démographique Européen[3] makes it possible to analyze the fertility postponement and recuperation process. As of the late 2000s, this process has been concluded in a few Western countries, is nearing the end in other ones and is in progress in all the other low fertility countries.

The paper begins with outlining the theory and methods applied. It continues with an analysis of the interaction of changing childbearing patterns with the overlay of birth cohorts in generating total period fertility declines and troughs as well as increases in 36 low fertility countries. The paper subsequently deals with a few corollary issues before ending with a summary and conclusions.

Theory and Methods

The seminal contribution of Bongaarts and Feenney (1998) has been to provide a method to correct period tempo distortions of total fertility rates. This method enables the calculation of adjusted total fertility rates during periods when births are being advanced or deferred. TPFR trends between 1950 and 1990 of the United States population were applied to provide an empirical illustration. As the main experience of low fertility populations during the past several decades has been postponement of births, its main application has been to demonstrate that as long as births are being postponed total fertility rates are distorted below adjusted rates. Once postponement ceases, total fertility rates revert to an undistorted state. That is what transpired in the US between 1963 and 1987.

In the next section an empirical analysis of the internal mechanism of postponement and recuperation is conducted in 36 low fertility countries. In principle this involves an analysis of the interaction of fertility trends between young women in younger cohorts with older women in

[3] Jean-Paul Sardon, Director (odeurope@wanadoo.fr)

older cohorts and how this interaction affects TPFR trends. Based on the experience of those populations that have completed or have gone through a considerable part of the path towards the end of the postponement and recuperation process[4], two models have been constructed, a "short" and an "extended" model. In the short model the postponement and recuperation process lasts about 20 years, in the extended model it lasts over 30 years. The critical factor distinguishing the two models is the duration of childbearing postponement. In the short model childbearing postponement lasts for a relatively short time, in the extended model it lasts considerably longer before it ends.

In simple terms, the *short* model starts with a phase of postponement among young women, which ceases after about 5 to 10 years, and is then followed by an equally long phase of childbearing recuperation among older women. The childbearing postponement during the first phase is reflected in a decline of the total period fertility rate (TPFR) below the corresponding total cohort fertility rate (TCFR). This is lagged by the average age of childbearing. The recuperation during the second phase is reflected in a TPFR increase roughly back to the corresponding TCFR level. Eventually, in a third phase postponement and recuperation stabilize and the period and cohort fertility rates settle at roughly the same level (Figure 1).

[Figure 1 about here]

The *extended* model consists of five phases:

1. A childbearing postponement among young women is reflected in a TPFR decline;
2. A continuing, possibly slowing, postponement coupled with a childbearing recuperation of older women is reflected in a partial TPFR increase;
3. A period of roughly offsetting postponement and recuperation trends is reflected in a stable TPFR trend below the TCFR level;
4. A cessation of postponement with continued recuperation is reflected in a TPFR increase to the TCFR level; and finally,
5. A cessation of postponement and recuperation resulting in a stable TPFR roughly equal to the TCFR level.

A trough is generated at the end of phase 1 and beginning of phase 2 when the extent of decline due to postponement of young women in the young cohorts is offset by the emerging extent of recuperation of older women in the older cohorts (Figure 1).

As will be demonstrated, many Western countries have passed through most of the five phases; some have gone through the entire cycle. A majority of populations has not completed the cycle and is at a certain point in the cycle. An approximation of phase 5 appears to be the endpoint for the foreseeable future, but new patterns may emerge (see footnote 3). Some populations leave out a phase.

The extended model provides a standard for assessing the status of the postponement and recuperation process in individual populations (Figure 1). The reason for this is the fact that

[4] This is not meant to imply that there will be no changes in the age patterns of fertility in the future. For the time being, childbearing postponement is slowing down, even ceasing, in many countries during the 2000s. This is what is reflected in the models.

actual developments in almost all populations are closer to the cycle of the extended model or at least parts thereof, rather than resembling the short model.

To construct the models a number of simplifying assumptions had to be adopted.
(a) TCFRs are lagged by 30 years, which is a generalization based on the fact that the mean age of childbearing is increasing in all these countries and in some has reached the age of 30;
(b) The 20-29 year old women represent the group in which postponements of fertility are taking place; and
(c) Most of the childbearing recuperation takes place among women 30-39 years of age.
These are gross simplifications as childbearing postponement does also occur among women below age 20 and some recuperation occurs below age 30. Nonetheless, in most of the low fertility countries in the 2000s around 95 percent or more of childbearing occurs within these two categories.

In both models the trends start at the tail end of the "baby boom" presumably in the early 1970s and with the birth cohorts of the early 1940s. As overall fertility is still declining, there is a continued decline in childbearing in the 20-29 age group as well as in the 30-39 age group of women. It was during the 1970s when in the western countries the average age of childbearing started to increase[5] and the postponement of fertility commenced. That is expressed in the continuing decline of fertility among the 20-29 years old women. During the late 1970s and early 1980s childbearing among women 30-39 years old levels off in both models. This implies the lack of any fertility recuperation. As childbearing postponement has been in progress for some time, birth recuperation gets under way in the mid 1980s.

The mechanism shaping the trend of total period fertility rates is the interaction between childbearing postponements of younger cohorts with childbearing recuperation of older cohorts. Consequently, the overlay of changing childbearing patterns of relevant birth cohorts at a time when fertility is being delayed is a crucial force in generating the TPFR trends in low fertility countries since the 1960s. The overlay of changing cohort childbearing patterns of successive cohorts was instrumental in generating
(a) TPFR declines;
(b) TPFR troughs, including years of "lowest-low" fertility; and
(c) TPFR increases, including the period fertility increases early in the 21st century when postponement was abating or ceasing.

Each of the 36 low fertility populations for which sufficient data are available has been analyzed. The populations have been classified into four groups, two of them with sub-groups, which share similar basic features in the postponement and recuperation process. The main criteria for this classification were (i) the birth cohorts in which childbearing postponement started and the period when this occurred; and (ii) closely correlated to this tends to be the year

[5] For evidence on levels and trends in cohort and period average ages of childbearing in the respective populations see Frejka and Sardon (2004) Table CO-12 on pp. 366-367 and graphs on pp. 50, 84, 116, 146, 176, 238-239, 308-309.

of the TPFR trough. The groups largely overlap with geographical regions and sub-regions. These are as follows[6]:

A. Western countries
   a. Nordic countries: Denmark, Finland, Norway, Sweden.
   b. Western Europe: Belgium, England & Wales, France, Netherlands.
   c. West Central Europe: Austria, West Germany, Switzerland.
   d. Non-European countries (English-speaking): Australia, Canada, New Zealand, United States.
B. Southern Europe: Greece, Italy, Portugal, Spain.
C. Central and Eastern Europe
   a. East Central Europe: Czech Republic, East Germany, Hungary, Poland, Slovak Republic.
   b. Eastern Europe: Bulgaria, Romania, Russian Federation.
   c. West Balkan Region: Bosnia & Herzegovina, Croatia, Macedonia, Slovenia, Yugoslavia.
D. East Asia: Hong Kong, Japan, South Korea, Taiwan.

Illustrations and analysis

Each region will be dealt with separately in the order listed above. For each country an assessment has been made of the main features of the childbearing postponement and recuperation process taking the extended model as the standard. These assessments have been compiled in tables for the regions. In addition graphs from selected countries will illustrate real developments. Occasionally the extent to which the standard can really be applied is not straightforward.

Western countries

As a rule the postponement of fertility started among the birth cohorts of the 1940s, usually during the 1970s (Table 1). The initiation of childbearing recuperation was not quite as uniform. In some populations it began almost simultaneously with postponement, elsewhere it started as much as a decade or so later. The TPFR troughs occurred in a range between 1976 and 1987, mostly in the early to mid 1980s. Thereafter the country cases described in the table and illustrated in the selected figures demonstrate the degree of considerable variation between countries and sub-regions.

[Table 1 about here]

The experience of the *Nordic countries,* especially Denmark (Figure 2, panel A), was reasonably close to the standard model with childbearing delays apparently ending around the year 2000. This signified the start of phase 4, i.e. as fertility recuperation was still in progress, the TPFRs were increasing moderately during the 2000s. Although it is too early to tell, in Sweden phase 5, in which also recuperation comes to an end, might have started in 2006. In

[6] This classification is also similar to the one applied in Frejka and Sardon (2004).

Finland the overall path of the process might have been somewhat irregular with difficult to detect phases 1 and 2, and a prolonged phase 3, nevertheless postponement apparently ceased in 2002, implying the start of phase 4 with a continued rise of recuperation and an increase of the TPFR.

[Figure 2 about here]

Among the countries of *Western Europe*, the Netherlands closely resembled the standard five phases of the extended model (Figure 2, panel B). This population is the only one that has clearly concluded the entire cycle. Belgium followed suite, however, without phase 5. Childbearing postponement has also come to an end in England & Wales and France, but the first two phases were irregular followed by relatively long durations of phase 3. The final phase 5 might have started in France, but not in England & Wales where recuperation was still continuing as of 2006.

The German-speaking populations of *West Central Europe,* Austria, West Germany and Switzerland, present a totally different picture (Figure 3, panel A). Essentially they all bypassed phase 2 and went directly into long stretches of phase 3 with childbearing postponement still continuing in the mid 2000s. This is being offset by steady but slow recuperation thus leading to relatively stable trends of TPFRs. Such trends are not likely to continue for much longer as fertility of young women was already very low in the mid 2000s.

[Figure 3 about here]

Among the English-speaking *non-European countries* the New Zealand population closely resembles the extended model, but it has not yet entered phase 5 (Figure 3, panel B). Australia and Canada have gone through prolonged phases 3. Close to 30 birth cohorts experienced continuing childbearing postponements being offset by steady fertility recuperations from the early 1980s through the mid 2000s. A fertility uptick among women of all ages materialized in Australia in 2007 as a result of policy interventions.

The childbearing postponement and recuperation process in the *United States* population has been exceptional in several ways (Figure 4).

[Figure 4 about here]

(i) The US population has been a precursor. Childbearing delays started in the US as one of the first and proceeded at a rapid pace during the early 1970s.
(ii) Childbearing delays came to an abrupt halt in the mid 1970s and have remained at a comparatively high level through the mid 2000s.
(iii) Fertility rates of young women have settled at a considerably higher level than in any other low fertility population; the cumulative fertility of the 20-29 age group in the US in the 2000s was at least twice as high as in most of the other low fertility countries.
(iv) In other populations the balances between the fertility delays of the 20-29 age group and the childbearing recuperation of the 30-39 age group include 95 percent or more of

total fertility, i.e. this means that the offsetting childbearing trends of these two age groups are clearly reflected in TPFR trends; in the US only 85 to 89 percent of total fertility occurs between the ages of 20 to 39 and teenage fertility is comparatively high; teenage fertility also needs to be taken into account when exploring the mechanism of interaction of age-specific fertility in generating TPFR trends.

To a considerable extent, these deviations, except for the first one, are presumably due to the multi-ethnic composition of the US population and the major ethnic groups having different childbearing patterns. Each of the ethnic groups (Whites, African Americans, Hispanic Americans and those of Asian descent) would require separate analyses, but data thus far were not available for such an exploration.

The overall childbearing postponement and recuperation cycle in the US lasted from the early 1970s and, at least for the time being, reached its end much sooner than any other population, by the early 1990s (Figure 4). It could be interpreted as the only population that resembled the short model with a trough lasting from the mid 1970s through the mid 1980s. Another interpretation could be that the US population went directly from phase 1 to phase 3 in the extended model and then proceeded to phases 4 and 5 (with the qualification that fertility trends of the 15 to 19 age group need to be part of the calculations).

Southern Europe

The postponement of childbearing started in South European populations among the 1950s birth cohorts during the 1980s (Table 2). The main developments in these populations are continuing albeit very gradual fertility delays from the early 1980s through the 2000s (Figure 5). Childbearing recuperation started in late 1980s or early 1990s but has been extremely modest. The outcome was very low, "lowest-low", period fertility in Spain (TPFR=1.16 in 1996), Italy (TPFR=1.19 in 1995), and Greece (TPFR=1.24 in 1999). The TPFR troughs were barely detectable. During the late 1990s and 2000s childbearing recuperations of older women in older cohorts counterbalanced continuing birth delays of young women. Thus moderate fertility increases were detected in Greece, Italy and Spain. The models hardly apply to these populations. It does appear that the process of postponement and recuperation has not yet been concluded in these countries even though fertility of young women was already very low, especially in Italy and Spain.

[Table 2 about here]
[Figure 5 about here]

Central and Eastern Europe

There was a great deal of variation between sub-regions and populations in this large region. In general, childbearing postponement started with the birth cohorts of the 1950s and 1960s for the most part during the 1980s and in several countries not until the early 1990s (Table 3)[7]. No matter when postponement started, it was considerable and proceeded at a rapid pace from one

[7] The structure of tables 3 and 4 differs slightly from tables 1 and 2 which reflects the fact that the populations of Central and Eastern Europe and East Asia started fertility later than the other ones.

birth cohort to the next. The developments in these populations are a notable illustration of the effects of overlapping birth cohorts with rapidly changing childbearing age patterns on trends of total period fertility rates. In most countries of Central and Eastern Europe TPFRs declined to unusually low levels labeled as "lowest-low" fertility (Kohler et al. 2002).

[Table 3 about here]

The rapid childbearing postponement was reflected in the TPFRs of the countries of *East Central Europe* around the year 2000: 1.13 in 1999 in the Czech Republic, 1.18 in 2002 in Slovakia, 1.22 in 2003 in Poland, and 1.27 also in 2003 in Hungary (Figure 6).

[Figure 6 about here]

A detailed analysis of the underlying changes in cohort childbearing patterns and their overlap using data from the Czech Republic will demonstrate why these TPFRs were so low.

[Figure 7 about here]

1. During the mid to late 1990s, women of the cohorts born in the late 1950s and early 1960s had very low fertility when they were in their thirties and forties because they had borne most of their children when they were young (Figure 7, panels A and B). Typically their lifetime childbearing age patterns were young, usually peaking around the ages of 21 and 22 with a high concentration of childbearing in their late teens and early twenties.

2. A gradual decline in fertility started among the late 1950s and early 1960s birth cohorts, even though these were hardly postponing any of their births (Figure 7, panels A and B).

3. The shift of childbearing into higher ages started among the late 1960s and early 1970s birth cohorts and then accelerated among the mid- 1970s cohorts (Figure 7). Note the considerable difference in the slope of the 1974 and the 1976 cohorts up to age 21 (Figure 7, panel B). This manifested itself in rapid declines of fertility among young women of successive cohorts of the early to mid 1970s (Figure 7, panel A) and appeared as rapid declines of period fertility among young women during the 1990s (Figure 6, panel A).

In sum, the overlay of the low fertility of older women of the late 1950s early 1960s birth cohorts with the rapidly declining and relatively low fertility of young women of the mid to late 1970s birth cohorts generated the period fertility trough of a TPFR equal to 1.13 in 1999 in the Czech Republic. It was the rapid pace of the childbearing age pattern shifts that were an important factor in generating the period fertility trough. While the total cohort fertility rates of the corresponding cohorts were declining only moderately (Figure 6), the rapid fertility decline among young women due to the fast pace of postponement was driving the rapid rate of TPFR decline in the years prior to 1999.

A significant proportion of the births that were being delayed among the 1970s birth cohorts during the 1990s eventually emerged as childbearing recuperation during the late 1990s and 2000s. In 1999, the amount of fertility recuperation equaled the continuing moderate

postponement and thereafter, during the 2000s more than counterbalanced postponement. The changing relation between childbearing recuperation and delays generated the TPFR 1999 trough and the TPFR increase during the 2000s in the Czech Republic (Figure 6, panel A).

The process of sizable and rapid childbearing postponement among the 1970s birth cohorts was similar in the other *Central East European* populations. The extent of fertility recuperation, however, was lesser than in the Czech Republic. That is the reason why there was very little, if any, TPFR growth. In Hungary, for instance, childbearing recuperation did pick up during the 2000s in the form of an increase in fertility of women in their thirties (CPFR 30-39), but this was counterbalanced by continued fertility postponement among young women (CPFR 20-29). Consequently the TPFR trend was flat (Figure 6, panel B).

The basic nature of the postponement and recuperation process was similar in *Eastern Europe*, again with differences between countries. Childbearing postponement was not very robust in Bulgaria during the 2000s, however, fertility delays had come to a standstill (Figure 8, panel A). Thus the TPFR increased. Recuperation was rather anemic in the Russian Federation from the mid 1990s up until 2006 and postponement was not continuing and so overall period fertility was basically flat. The Putin childbearing incentives of 2006 had a positive impact on fertility at all ages (Figure 8, panel B).

[Figure 8 about here]

The *West Balkan region* is demographically unusually diverse. Only a few decades ago Bosnia & Herzegovina and even more so Macedonia still had extremely high fertility and mortality. On the other hand, Slovenia was demographically and otherwise an advanced country. Also, the unstable political situation during past decades played a role. Even before the wars of the 1990s, the former Yugoslavia was not a typical "East" European country as it was relatively independent with more ties to Western countries than other East European ones. The childbearing postponement and recuperation process started earlier than in other countries of Central and Eastern Europe, especially in Slovenia and proceeded at a rather even pace (Figure 9, panel A). As of the early 1990s, very low period fertility was reached and remained at that level through the mid 2000s. This was due to a prolonged balance between emerging respectable fertility recuperation and ongoing steady postponement. Croatia's TPFR has been quite stable in the 2000s as well due to a somewhat similar balance of postponement and recuperation (Figure 9, panel B).

[Figure 9 about here]

East Asia

The long-term demographic history of Japan is very different than that of Hong Kong, South Korea and Taiwan. At the time when Japan had reached replacement fertility in the mid-1950s, the other countries of East Asia still had total period fertility rates of five to seven births per woman. During the following decades fertility declined rapidly in Hong Kong, South Korea, and Taiwan reaching replacement fertility in the 1980s. The fertility decline in all four populations continued during the 1980s, 1990s, and into the 2000s. By the mid to late 2000s period fertility

rates in these countries were among the lowest in the world. In 2005 the TPFR was 0.97 in Hong Kong, 1.11 in Taiwan, 1.12 in South Korea, and 1.23 in Japan. Since the mid 1970s the process of childbearing postponement and recuperation has been reasonably uniform in these four populations (Table 4). Childbearing delays have been continuing at least for over two decades by the mid to late 2000s and almost none of the delayed births have been recuperated (Frejka et al. 2010). There are some signs childbearing delays might have started to level off in the mid 2000s in Japan and with continuing incipient recuperation this might mean the beginning of phase 4 (Figure 10, panel A). Similar, possibly even slightly stronger trends appear to be nascent in South Korea (Figure 10, panel B). It is, however, too early to tell whether these trends will be continuing.

[Table 4 about here]
[Figure 10 about here]

The effect of cohort overlay in generating period fertility trends in Western countries in the 1990s and 2000s

In the analysis of Western countries it was shown that most of them were experiencing TPFR increases in the late 1990s and early 2000s. They had commenced phase 4 which is characterized by slow or ceasing childbearing delays of young women in young cohorts outweighed by respectful childbearing recuperation of older women in older cohorts (Table 1, col. "Phase 4 started in year"). In this section a more detailed analysis is presented of the way in which continued changes in the childbearing age patterns of these populations, i.e. of how the postponement of fertility worked its way through the age structure from the young to the older ages when delayed births were being materialized.

The trends in Denmark, New Zealand and the Netherlands provide an illustration of what transpired.

In Denmark and New Zealand, after the peak years of the 1990s a period of minor total period fertility rate fluctuations set in (Figure 2, panel A and Figure 3, panel B). During the 1990s the late childbearing of the older cohorts of the 1960s approximated the volume of the declining fertility of young women in younger cohorts of the 1970s (Figure 11, panels B and C). A state of an imperfect equilibrium between the fertility of young women and that of older women in overlapping cohorts was reached.

[Figure 11 about here]

In the Netherlands a different scenario developed. In the 1990s childbearing delays were still under way among the cohorts of the 1960s. This is reflected, for instance, in the decline of ASFRs from one year to the next between 1990 and 1996 in the age 24 and 27 curves (Figure 11, panel A, left hand graph). At the same time, women of the 1950s birth cohorts were recuperating some of the births they had delayed when they were young. This is reflected in the ASFRs increase between the same years, for instance, in the age 33 and 36 curves (Figure 11, panel A, right hand graph). The information derived from this figure does not reveal whether the delays in

childbearing of the 1960s cohorts of young women in the years 1990 to 1996 outweigh the recuperated births of the 1950s cohorts older women, or vice versa. That information is illustrated by comparing the period ASFRs in 1990 and 1996 (Figure 12, panel A, left graph) which demonstrates that between 1990 and 1996 the sum of the period ASFR declines up to age 30 (-0.18 births per woman) outweighed the sum of the ASFR increases above age 30 (+0.09 births per woman). The difference between these sums (minus 0.09 births per woman) is the amount by which the TPFR declined between 1990 and 1996, from 1.62 to 1.53, respectively.

[Figure 12 about here]

Subsequently, between 1996 and 2000 when the early 1960s and early 1970s birth cohorts were in their prime ages of childbearing, period ASFRs of younger women of the 1970s cohorts were no longer declining, however the ASFRs of older women were continuing to increase (Figure 12, panel A). Between 1996 and 2000 the 1970s birth cohorts were no longer delaying births at a time when the 1960s cohorts were recuperating the births they had delayed when younger. The comparison of the 1996 period ASFRs with those of 2000 illustrates that ASFRs were higher at all ages in 2000, however the differences between younger women in the two years were small and the differences among older women were more substantial (Figure 12, panel A). As a result the total period fertility rate in the Netherlands increased from 1.56 in 1996 to 1.72 in 2000 mainly due to the recuperation of births among the 1960s birth cohorts which were overlapping with the 1970s cohorts that were no longer delaying births.

The structural fertility trends between 1990 and 2000 in the Netherlands resembled those of the 1976 to 1990 period, but at a reduced scale. In like fashion as a period fertility trough occurred in 1983, a similar trough occurred in 1996 (Figure 2, panel B).

In principle, the structural fertility trends that occurred in the Netherlands between 1996 and 2000 took place in almost all Western countries during the 1990s and especially during the 2000s, although the specifics differed from one country to another. Childbearing delays among the 1960s and 1970s birth cohorts either slowed down or ceased altogether as shown in the examples of the Netherlands, Denmark and New Zealand (Figure 11, panels A, B & C, left hand graphs). At the same time, i.e. during the 1990s and 2000s, older women of the 1950s, 1960s and 1970s birth cohorts were having births they had delayed when younger (Figure 11, panels A, B & C, right hand graphs).

The result was that as a rule after the years of moderately fluctuating TPFRs during the 1990s TPFRs were increasing during the 2000s. As a rule, the ASFRs of younger women of successive birth cohorts were no longer declining because the postponement of childbearing was ending, whereas ASFRs of older women were increasing from one birth cohort to the next (Figure 12, panels A, B & C, right hand graphs). The combination of the recuperation of births of older birth cohorts predominantly of the 1960s who were overlapping with the younger women of the 1970s and early 1980s birth cohorts who were no longer delaying births was the decisive reason for the period fertility increases in Western countries in the 2000s.

Finally, in the Netherlands it appears that in the early to mid 2000s there were no longer any delayed births to be recuperated, i.e. the recuperation of delayed births had ceased. Note that

the tail ends of the age 33 and 36 curves had become flat in the 2000s (Figure 11, panel A, right hand graph). The population of the Netherlands appears to be the first one that has "come full circle" from the initiation of childbearing delays among the cohorts of the late 1940s in the 1960s (Frejka and Sardon 2004:73-84) to discontinuance thereof among the birth cohorts of the late 1970s and early 1980s cohorts in the 2000s (Figure 11, panel A, right hand graph).

The static and dynamic perspectives

At any point in time of analyzing the process of changing childbearing patterns of the overlay of successive birth cohorts it can be useful to register the value of the total period fertility rate (TPFR) of a specific year. As the succession of TPFRs is followed, trends become evident and troughs and peaks can be identified. The value of the TPFR in a specific year which is the result of the overlay of cohort age-specific fertility rates of different birth cohorts provides a *static* perspective.

Trends of TPFRs are the outcome of changing ASFRs of women in successive cohorts at each age. Most of the time, a fertility trend of young women is offset by a trend in the other direction of older women. It is also possible for the direction of fertility trends of young and older women to coincide. When childbearing is being postponed, there are four *dynamic* perspective possibilities:

1. A decline in fertility of young women in successive birth cohorts outweighs the fertility increase of older women. The outcome is a TPFR decline.
2. An increase in fertility of older women in successive birth cohorts outweighs a fertility decline of young women. The outcome is a TPFR increase.
3. & 4. The fertility trend of young and older women in successive birth cohorts goes in the same direction, down or up, in which case the outcome is either a TPFR decrease or increase.

How can birth cohort overlay findings be reconciled with findings on the effects of behavioral and socio-economic factors on fertility trends?

A comprehensive investigation into the compatibility of the effects of overlapping birth cohort childbearing age patterns of successive cohorts on fertility, on the one hand, with findings on the effects of behavioral, socio-economic and policy factors on fertility trends is beyond the scope of this paper. It does, however, appear useful to investigate whether research exploring the effects of socio-economic conditions and policies on fertility levels and trends requires some re-evaluation in light of the cohort overlay effect findings discussed in this paper.

Provided the findings on the effect of cohort overlay of changing childbearing patterns on TPFRs are valid, it appears fitting to explore, for instance, how the research on the appearance and disappearance of lowest-low fertility due to socio-economic and policy factors can be reconciled with the former (Goldstein et al. 2009, Kohler et al. 2002). Also, an investigation of whether some of the findings assigning fertility increases early in the 21st century either to changed behavioral attitudes of women and couples, or to social and population policies, or to changing economic conditions (Goldstein et al. 2009, Kocourková 2009, Kohler et al. 2002, Myrskylä et al. 2009) are compatible with the findings in this paper would be indispensable.

It appears that the overlay of lifetime childbearing patterns of different cohorts at a time when these patterns were changing was a crucial force in generating the period fertility increases in Western countries early in the 21st century. Social, economic or population policies, or the development of more or less favorable societal conditions may have contributed to the TPFR increases but mainly by influencing changes in childbearing patterns in overlapping successive birth cohorts. Furthermore, the period fertility increases apparently occurred as a consequence of specific birth cohort overlays at a time when quantum fertility was relatively stable or declining. The latter can be proven conclusively only for the period fertility troughs and subsequent increases in the Western countries in the 1980s and early 1990s. It appears that analogous developments presented themselves in the 2000s, however this will only be confirmed or refuted by developments during the 2010s.

Summary and conclusions

A. In low fertility populations during the past half century for the most part childbearing was being shifted towards higher ages. The overlay of these changing cohort childbearing age patterns in successive birth cohorts were instrumental in:

1. *Generating total period fertility rate declines in the initial years of childbearing postponement*. The TPFR declines occur because in the initial years childbearing postponement consists of fertility declines of young women and fertility of older women in overlaying birth cohorts is not affected. The speed of the TPFR decline is directly correlated with the speed of the shifts in childbearing age patterns. A more pronounced shift of childbearing into older ages generates a more rapid TPFR decline. The TPFR decline occurs because the size of the fertility decline among young women outweighs a possible increase in fertility among older women.

2. *Generating TPFR troughs*. Towards the end of the first phase of childbearing postponement fertility is relatively low among young women of the overlapping younger cohorts as well as low among the older women in the overlapping older cohorts which had a relatively young childbearing age pattern. The combination leads to a period fertility trough.

3. *Generating TPFR increases following the period fertility troughs*. Once childbearing postponement has been taking place for several years, the delayed births are starting to materialize among older women while childbearing continues to decline among young women in overlapping birth cohorts. For TPFRs to increase the numbers of delayed births materializing has to outweigh the continuing decline of fertility among young women.

B. The above processes occurred in Western countries predominantly during the 1970s and 1980s. In Central and Eastern Europe they occurred predominantly during the 1990s and 2000s, The typical cycle in Western countries consisted of a TPFR decline in the 1970s and early 1980s, a trough in the early to mid 1980s, and a TPFR increase in the late 1980s. In Central and Eastern Europe typically a rapid TPFR decline occurred during the 1990s, the period fertility trough appeared in the late 1990s or early 2000s, and the TPFR increase took place in the 2000s.

C. The populations of Southern Europe and East Asia experienced long periods of childbearing postponement usually starting in the 1980s combined with weak or almost non-existing fertility recuperation. Consequently TPFRs were at best stable, but more often declining. In some populations in the 2000s, such as Italy and especially Spain, childbearing postponement approached a floor and a moderate fertility recuperation caused TPFRs to rise.

D. In Western countries the birth cohort overlay combined with changing childbearing age patterns was instrumental in generating period fertility increases predominantly early in the 21st century. In most countries childbearing postponement was slowing down or ceasing among the 1970s birth cohorts. Thus, as a rule, in the early 21st century fertility was no longer declining among young women or the decline was moderate, but childbearing was increasing among older women of the overlapping 1960s birth cohorts whose delayed births were materializing. This resulted in TPFR increases.

E. Total period fertility rates were increasing in almost all European countries early in the 21st century, however, the structural causes of this increase were different in Western countries compared to Central and Eastern Europe. In the latter countries the postponement of childbearing was clearly in progress with fertility of younger women in young cohorts declining, and the first wave of delayed births of relatively older cohorts was materializing. The weight of the delayed births was more than counterbalancing the declining fertility of younger women. In contrast, postponement of childbearing was abating in Western countries and the last wave of delayed births of older cohorts was materializing. In part this point summarizes what is already contained in two prior conclusions, B. and D.

F. After a cessation in childbearing postponement works its way through the main periods of the childbearing ages, total period fertility rates resemble total cohort fertility rates. Any further fertility trends depend on overall quantum trends. This happened early in the 21st century in The Netherlands.

G. The findings of the research on overlays of successive birth cohorts with changing childbearing patterns indicate that fertility trends are simultaneously cohort *and* period driven. For the most part, period factors determine cohort childbearing patterns and their changes, and the overlays of changing cohort childbearing patterns are instrumental in shaping period fertility rates. The frequently made distinction between cohort and period driven fertility trends appears questionable.

H. There is a need to explore whether the findings on how changing childbearing age patterns of overlapping birth cohorts which generate period fertility declines, troughs and subsequent TPFR increases, on the one hand, can be reconciled with research findings attributing the appearance and disappearance of lowest-low fertility as well as increases in period fertility in the 21st century directly to social, economic and other causes.

Acknowlegements

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References

Billari, F.C. 2008. "Lowest-low fertility in Europe: Exploring the causes and finding some surprises," *Japanese Journal of Population* 6(1): 2-18.

Billari, F. C. and H.-P. Kohler. 2004. "Patterns of low and very low fertility in Europe," *Population Studies* 58 (2): 161-176.

Bongaarts, J. 2002. "The end of the fertility transition in the developed world," *Population and Development Review* 28 (3): 419-433.

Bongaarts, J. and G. Feeney. 1998. "On the quantum and tempo of fertility," *Population and Development Review* 24 (2): 271-291.

----------. 2006. "The quantum and tempo of life cycle events," *Vienna Yearbook of Population Research 2006*:115-151

Castles, F.G. 2003. "The world turned upside down: below replacement fertility, changing preferences and family-friendly public policy in 21 OECD countries," *Journal of European Social Policy* 13 (3): 209–227.

Frejka, T. 2008. "Determinants of family formation and childbearing during the societal transition in Central and Eastern Europe" Overview Chapter 5 in: T. Frejka et al. (eds.) *Childbearing trends and policies in Europe*. *Demographic Research, Special Collection* 7, Vol. 19(7): 139-170.

Frejka T., G. W. Jones and J.-P. Sardon 2010. "East Asia childbearing patterns and policy developments." *Population and Development Review* 36 (3): 579-606.

Frejka, T. and J.-P. Sardon. 2004. *Childbearing trends and prospects in low-fertility countries*. Volume 13, European Studies of Population, Kluwer Academic Publishers, Dordrecht.

----------. 2009. "Contemporary childbearing trends in low-fertility countries." Paper presented at the XXVIth IUSSP International Population Conference, Marrakech, Morocco. 27 September-2 October.

Frejka T., T. Sobotka, J. M. Hoem and L. Toulemon (eds.) 2008. *Childbearing trends and policies in Europe*. *Demographic Research, Special Collection* 7, Vol. 19(1-29): 1-1178.

Goldstein, J. R., T. Sobotka and A. Jasilione. 2009. "The end of 'Lowest-Low' Fertility?" *Population and Development Review* 35 (4): 663-699

Goldstein J., W. Lutz and M. R.Testa. 2003. "The emergence of sub-replacement family size ideals in Europe." *Population Research and Policy Review* 22: 479–496.

Hajnal, J. 1947. "The analysis of birth statistics in the light of the recent international recovery of the birth-rate," *Population Studies* 1 (2): 137–164.

Jones G., P.T.Straughan and A.Chan (eds.). 2009. *Ultra-low Fertility in Pacific Asia: Trends, causes and policy issues.* Routledge, Taylor & Francis Group, London and New York.

Kocourková, J. 2009. "The Current 'Baby boom' in the Czech Republic and Family Policy," *Czech Demography* vol. 3: 43-53.

Kohler, H.-P., F. C. Billari and J. A. Ortega. 2002. "The emergence of lowest-low fertility in Europe during the 1990s." *Population and Development Review* 28(4): 641-680.

Konietzka, D. and M. Kreyenfeld (eds.). 2007. *Ein Leben Ohne Kinder: Kinderlosigkeit in Deutschland*, Wiesbaden: Verlag für Sozialwissenschaften.

Lesthaeghe, R. 1995. "The second demographic transition in Western countires: An interpretation". In: K. O. Mason and A.-M. Jensen (eds.) *Gender and family change in industrialized countries.* Oxford. Clarendon Press, pp. 17-62.

----------. 2001. "Postponement and recuperation: Recent fertility trends and forecasts in six Western European countries," IPD Working Paper 2001-1, Interface Demography, VUB, Brussels.

Lesthaeghe, R. and L. Neidert. 2006. "The second demographic transition in the United State: Exception otr textbook example?" *Population and Development Review* 32(4): 669-698.

Lesthaeghe, R. and D. J. van de Kaa. 1986. "Twee demografische transities?" In: D. J. vand de Kaa and R. Lesthaeghe (eds.) Bevolking: groei en krimp. Van Loghum Slaterus, Deventer, pp. 9-24.

Lutz W. and Skirbekk V. 2005. "Policies Addressing the Tempo Effect in Low-Fertility Countries." *Population and Development Review* 31(4): 703-725.

Myrskylä, M., H.-P. Kohler, and F. C. Billari. 2009. "Advances in development reverse fertility declines," *Nature* 460: 741-743.

McDonald, P. 2002. "Sustaining fertility through public policy: The range of options." *Population-E* 57 (3): 417-446.

----------. 2006a. "An assessment of policies that support having children from the perspectives of equity, efficiency and efficacy." *Vienna Demographic Yearbook 2006*: 213-234.

----------. 2006b. Low fertility and the state: The efficacy of policy. *Population and Development Review*, 32(3): 485-510.

Observatoire Démographique Européen. 2010. *Data Bank*. St. Germain-en-Laye, France.

Ryder, N. B. 1964. "The process of demographic translation," Demography 1(1): 57-82.

Sobotka, T. 2003. "Tempo-quantum and period-cohort interplay in fertility changes in Europe. Evidence from the Czech Republic, Italy, the Netherlands and Sweden," *Demographic Research* 8(6): 151-213.

----------. 2004a. "Is lowest-low fertility explained by the postponement of childbearing?" *Population and Development Review* 30(2): 195-220.

----------. 2004b. *Postponement of childbearing and low fertility in Europe*. PhD Thesis, University of Groningen. Amsterdam: Dutch University Press.

Sobotka T. and L. Toulemon. 2008. "Changing family and partnership behaviour: Common trends and persistent diversity across Europe." Overview Chapter 4 in: T. Frejka et al. (eds.) *Childbearing trends and policies in Europe*. *Demographic Research, Special Collection* 7, Vol. 19(3): 85-138.

Table 1 (part one) – Characteristics of childbearing postponement and recuperation process, Western countries

Region, Country	Start of delay - cohorts	Start of delay - period	Start of recuperation and status	Year of trough	Phase 2	Phase 3 started in year	Status of delays - late 1990s and 2000s	Phase 4 started in year	Phase 5 started in year	Comments
Nordic countries										
Denmark	Late 1940s	Early 1970s	Early 1980s	1983	Y	1992	Ceased around 2000	Around 2000	N	
Finland	Early 1940s	Early 1970s	Early 1970s – steady increase	1987 ?	N	1990	Ceased 2002	2002	N	Phases 1 & 2 unclear; long-term slow postponement and recuperation; prolonged phase 3 from 1990 to 2002
Norway	Early 1940s	Early 1970s	Late 1970s	1983-84	Y	1992	Ceased 2002	2002	N	Moderate trends
Sweden	Late 1940s	Early 1970s	Mid 1970s	1978	Y	N	Ceased 1998	1999	2006	Large swings due to policy intervention
Western Europe										
Belgium	Late 1940s	1970s	Mid 1980s – steady increase	1985	Y	1991	Ceased mid-1990s	1995	N	
England & Wales	Late 1940s	Around 1980	Around 1982 –steady increase, acceleration after 2001	1983-84	N	1985	Ceased 2001-02 and reversed slightly	2001	N	Not typical: No phases 1 & 2, no initial trough; long phase 3
France	Late 1940s	Late 1970s	Around 1983- steady increase	N	N	1983 – decade long	Delays ceased 1993	1993	2006?	Not typical: Weak phases 1 & 2, no initial trough; long phase 4
Netherlands	Late 1940s	Late 1970s	Late 1970s – steady increase till 2003 then flat	1983	Y	1986	Delays ceased 1996 then flat	1996	2000	

Table 1 (continued) – Characteristics of childbearing postponement and recuperation process, Western countries

Region, Country	Start of delay - cohorts	Start of delay - period	Start of recuperation and status	Year of trough	Phase 2	Phase 3 started in year	Status of delays - late 1990s and 2000s	Phase 4 started in year	Phase 5 started in year	Comments
West Central Europe										
Austria	Late 1940s	Early 1980s	Late 1980s – steady increase	1987	Y	1991	Steady decline	N	N	± phase 3 1991 - 2006
West Germany	Late 1940s	Early 1970s	Late 1980s – steady increase	1985	Y	1988	Flat 1995 - 1999	N	N	Continuous stage 3: 1988 to 1999; data only till 1999!
Switzerland	Mid 1940s	Early 1970s	Late 1970s – steady increase	1978	N	1978	Steady decline	N	N	± continuous phase 3 1978 - 2006
Non European Countries (English-speaking)										
Australia	Late 1940s	Mid 1970s	Early1980s – steady increase	1980	N	1980	Continuous till 2006	N	N	Continuous phase 3: 1980 to 2006; policy intervention 2007
Canada	Early 1940s	Early 1970s	Late 1980s – steady increase	1987	N	1991	Continuous delays	N	N	Continuous stage 3: 1991 to 2005; data only till 2005
New Zealand	Late 1940s	Late 1970s	Mid 1980s – steady increase	1983-85	Y	1990	Flat 1998-2005	2002	N	Fertility increase at all ages 2005-2007
United States	Early 1940s	Late 1970s – start and end of delays	Mid 1970s – steady increase	1976	N	1976	Flat 1976 - 2006	1983	1990	Precursor/Exception – Postponement ended with 1950s cohorts in late 1970s

Table 2 – Characteristics of childbearing postponement and recuperation process, Southern Europe

Country	Start of delay - cohorts	Start of delay - period	Start of recuperation and status	Year of trough	Phase 2	Phase 3 started in year	Status of delays late 1990s and 2000s	Phase 4 started in year	Phase 5 started in year	Comments
Greece	Mid 1950s	Early 1980s	Late 1980s - modest	1999 - moderate	Very gradual	N	Continuous decline	N	N	
Italy	Mid 1950s	Early 1980s	Late 1980s - modest	1995	N	N	Level after 1997	1998 – Gradual TPFR increase	N	
Portugal	Late 1950s	Late 1980s	Early1990s – Very modest	1995	Very gradual TPFR increase	N	Continuous decline	N	N	2000 TPFR peak followed by decline
Spain	Late 1950s	Early 1980s	Early1990s – Very modest	1996-1998	N	N	Level after 1998	Gradual	N	

Table 3 (part one) – Characteristics of childbearing postponement and recuperation process, Central and Eastern Europe

Region, Country	Start of delay - cohorts	Start of delay - period	Status of delays late 1990s-2000s	Start and status of recuperation	Year of trough	Phase 2	Phase 3	Phase 4	Comments
East Central Europe									
Czech Republic	Early 1960s	Early 1990s	Continuous - weakening delays	Early 2000s - notable	1999	Starting 2000	N	N	
Hungary	Late 1950s	Early 1980s	Continuing delays	Minor early 1980s - Notable 1990s	1999-2003	Starting 2004	N	N	Trough very recent – phase 2 barely started
Poland	?	Early 1980s modest - Early 1990s notable	Continuing delays	Mid 2000s - modest	2003 ?	Starting 2004 ?	N	N	Trough very recent – phase 2 barely started
Slovak Republic	Late 1960s	Early 1990s	Continuing delays	Early 2000s - moderate	2003	Starting 2004 ?	N	N	Trough very recent – phase 2 barely started
East Germany	Early 1960s	Early 1980s	n.a.	Mid 1990s	1994	Peculiar – All ages rise 1995+	n.a.	n.a.	Data only till 1998
Eastern Europe									
Bulgaria	Late 1960s	Late 1980s	Flat - delays ended	Late 1990s - moderate	1997	N	N	Starting 1998	
Romania	Late 1960s	(Early 1980s) Early 1990s	Continuing moderate delays	Mid 1990s - moderate	1996?	N	Starting 1995	N	
Russia	Late 1960s	Late 1980s	Flat	Mid 1990s – moderate; 2000s faster	1999	N	N	Starting 2000	Policy intervention 2006

Table 3 (continued) – Characteristics of childbearing postponement and recuperation process, Central and Eastern Europe

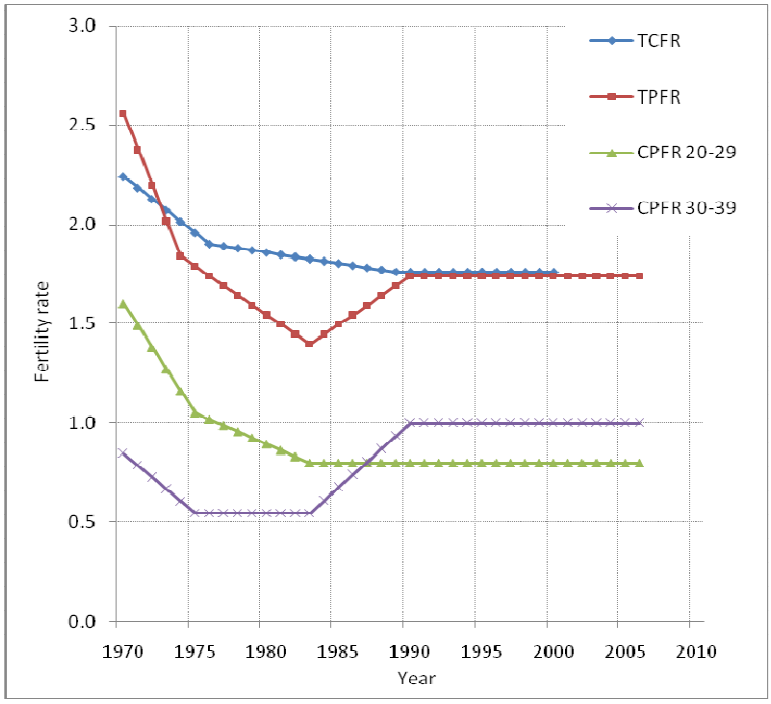
Region, Country	Start of delay - cohorts	Start of delay - period	Status of delays late 1990s-2000s	Start and status of recuperation	Year of trough	Phase 2	Phase 3	Phase 4	Comments
West Balkan Region									
Bosnia & Herzegovina	1950s?	Mid 1980s	Continuing declines	None by 1990	None	N	N	N	Still in phase 1 in late 1980s - Data only till 1990!!!
Croatia	Late 1950s	Early1980s	Continuing moderate delays	Early 1990s-moderate	None	N	Started 1998? – post war	N	No trough; Equilibrium 1998-2006 affected by war
Macedonia	Early 1960s ?	Mid1990s?	Continuing declines	None by 2006	None by 2006	N	N	N	
Slovenia	Late 1950s	Late 1970s	Continuing delays	Early 1990s - notable	1999-2003?	N	Started 1993	N	No real trough; Equilibrium 1993-2006
Yugoslavia	Early 1950s	Early1980s	Continuing delays	None by 2003	None	N	N	N	Still in phase 1 in early 2000s - Data only till 2003

Table 4 – Characteristics of childbearing postponement and recuperation process, East Asia

	Start of delay - cohorts	Start of delay - period	Status of delays late 1990s-2000s	Start and status of recuperation	Year of trough	Phase 2	Phase 3	Phase 4	Comments
East Asia									
Hong Kong	Unknown – data not available	?	Continuing delays	None	?	N	? 1980s till 1994	N	Flat TPFRs late 1980s till 1994 – then decline
Japan	Late 1940s	Mid 1970s	Continuing delays	Around 1980-extremely modest	2005?	N	N	Possibly started 2005	
South Korea	Unknown – data not available	Early 1980s	Continuing delays till 2005 then leveling	Around 1990 - modest	2005	N	N	Started 2005	1990 -2005 More delays than recuperation – Will phase 4 continue?
Taiwan	Unknown – data not available	?	Continuing delays	Late 1980s modest till late 1990s then stalled (modest decline	?	N	N	N	TPFRs declining in 2000s

Figure 1 – Models depicting total cohort fertility rates (lagged by 30 years), total period fertility rates, cumulative period fertility rates 20-29 and 30-39, for low fertility populations, 1970-2006/7

A. Simple



B. Extended

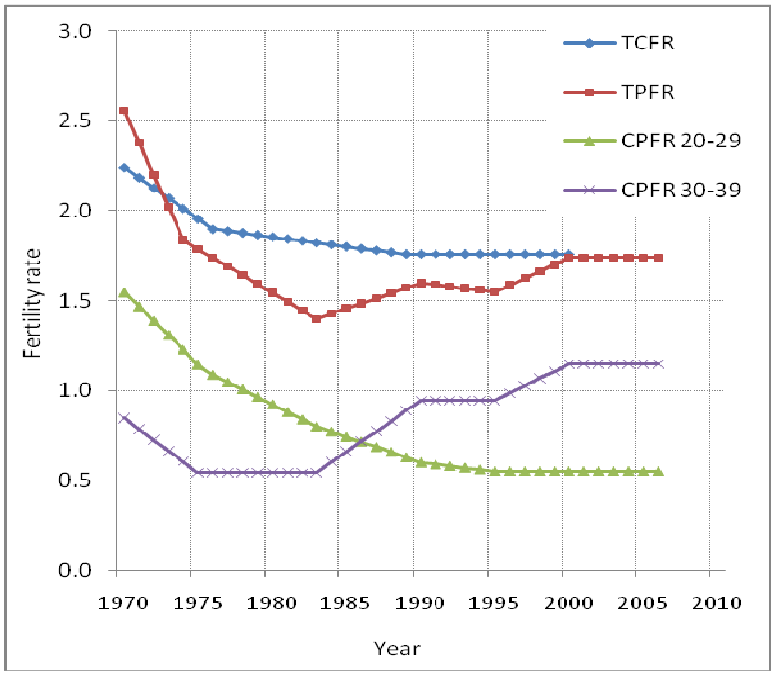
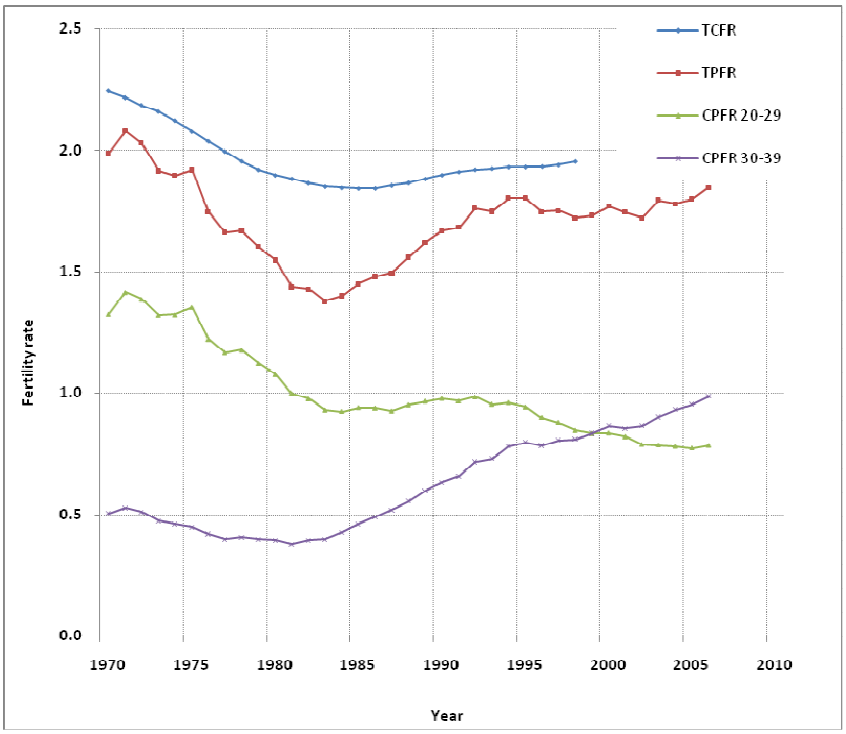


Figure 2 - Total cohort fertility rate (lagged by 30 years), total period fertility rate, cumulative period fertility rates 20-29 and 30-39, Denmark and Netherlands, 1970-2006

A. Denmark



B. Netherlands

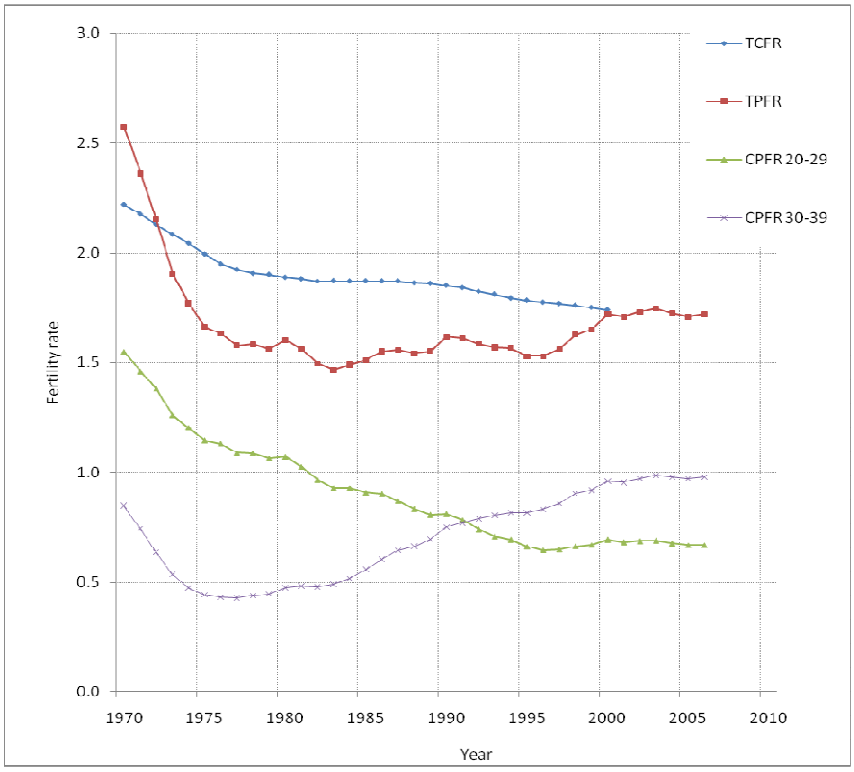
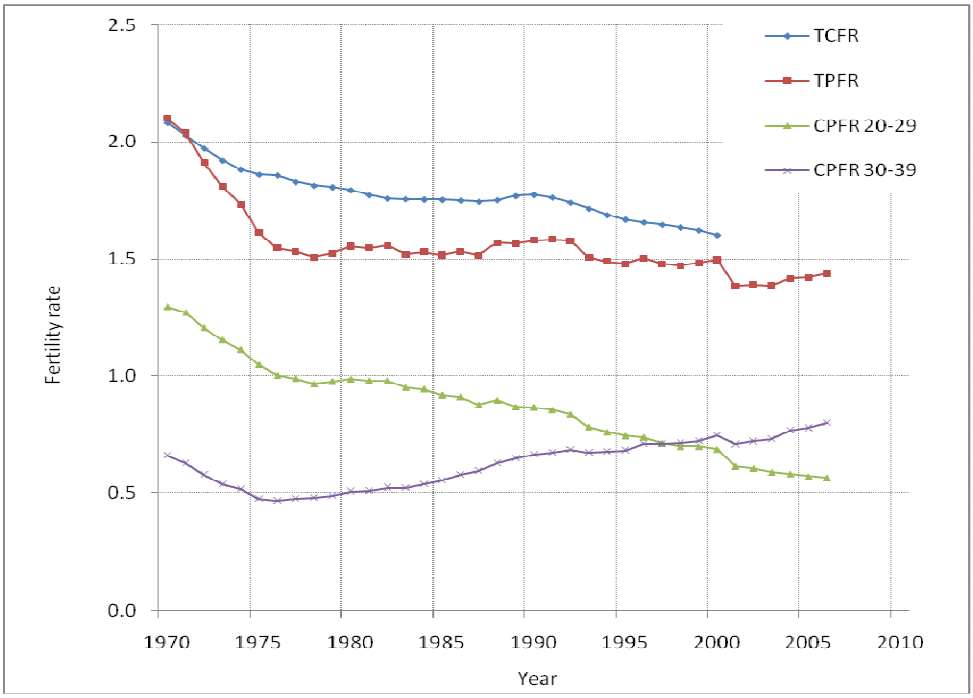


Figure 3 - Total cohort fertility rate (lagged by 30 years), total period fertility rate, cumulative period fertility rates 20-29 and 30-39, Switzerland and New Zealand, 1970-2007

A. Switzerland



B. New Zealand

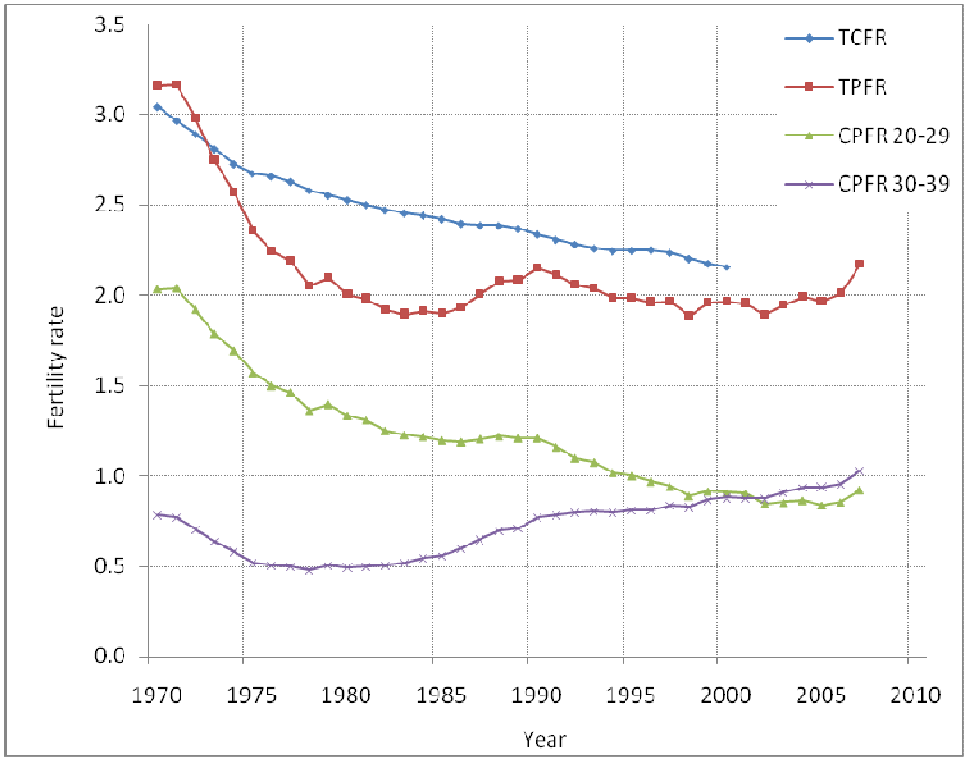


Figure 4 – Total cohort fertility rate (lagged by 30 years), total period fertility rate, cumulative period fertility rates 20-29 and 30-39, United States, 1970-2006

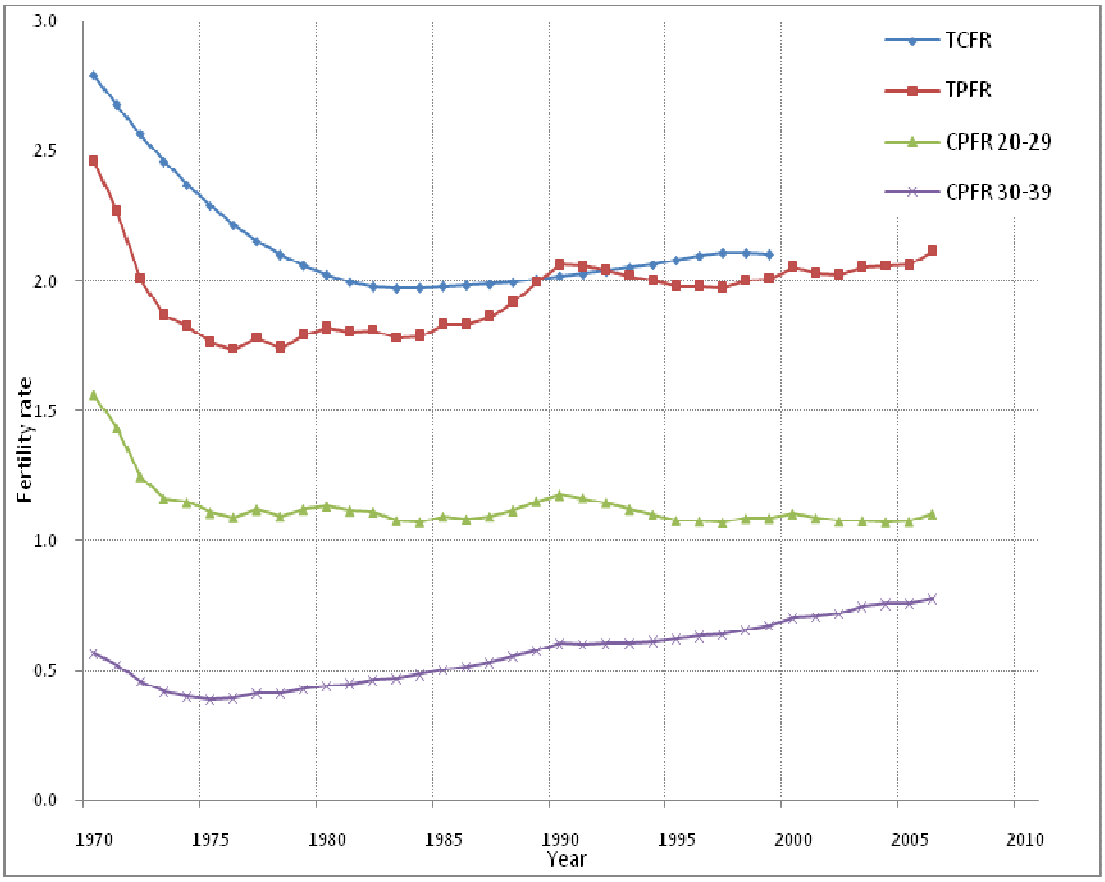
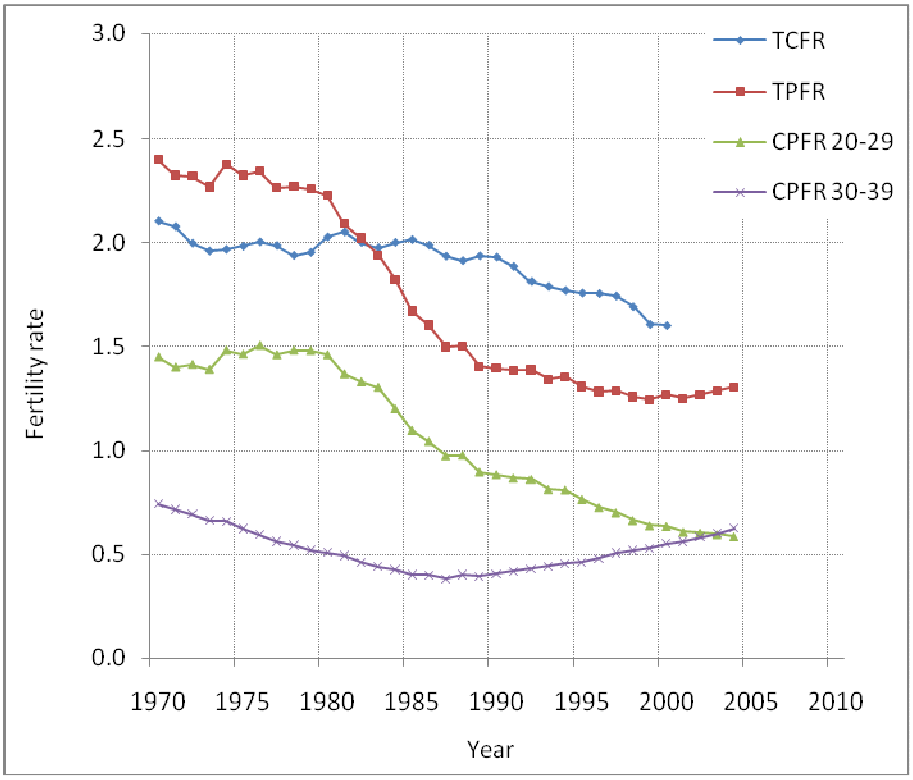


Figure 5 - Total cohort fertility rate (lagged by 30 years), total period fertility rate, cumulative period fertility rates 20-29 and 30-39, Greece and Portugal, 1970-2006

C. Greece



D. Portugal

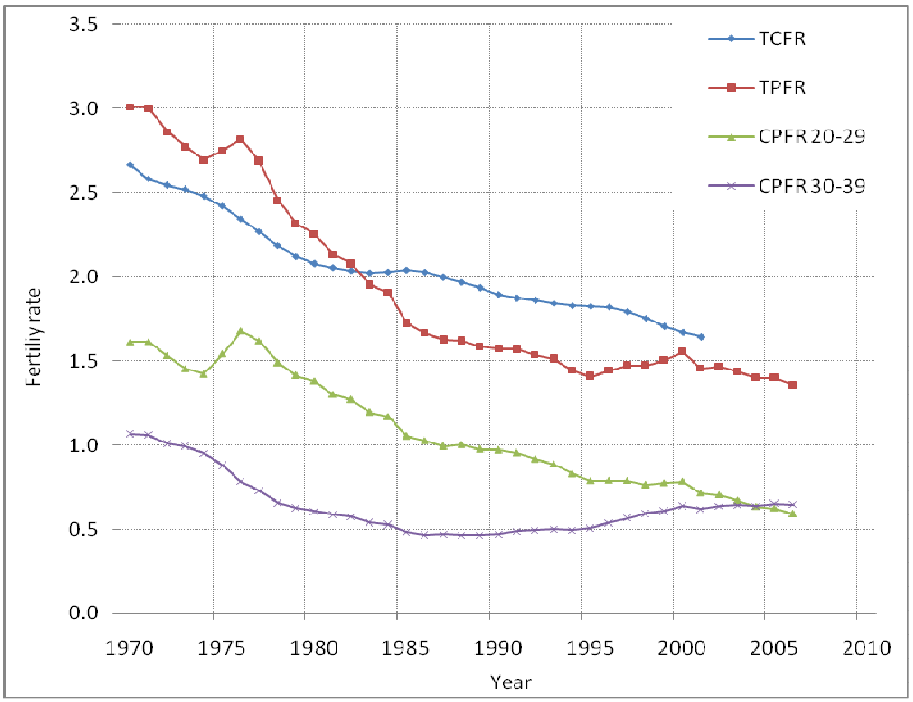
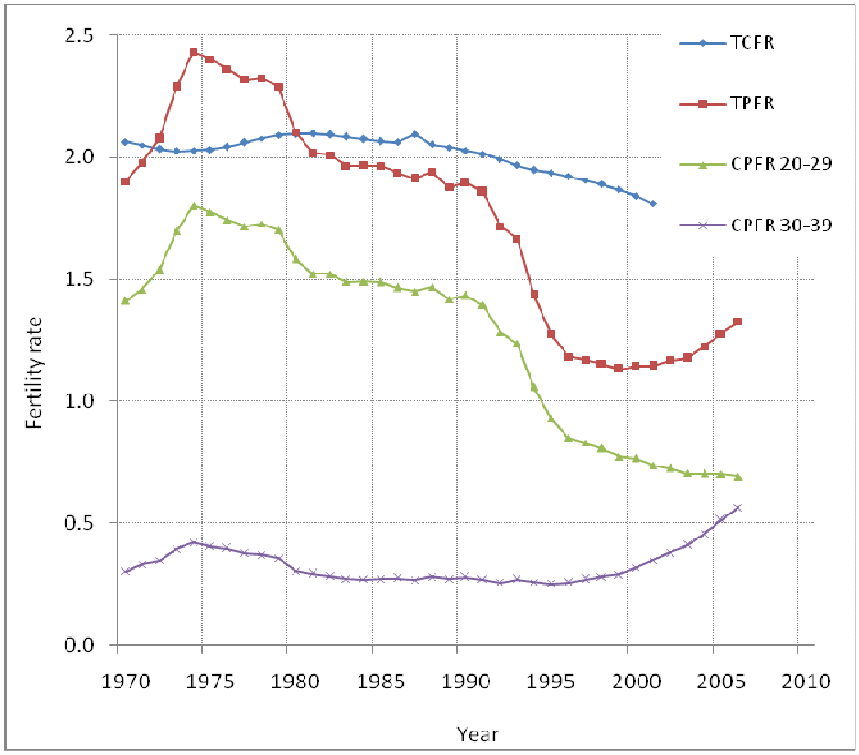


Figure 6 - Total cohort fertility rate (lagged by 30 years), total period fertility rate, cumulative period fertility rates 20-29 and 30-39, Czech Republic and Hungary, 1970-2006

A. Czech Republic



B. Hungary

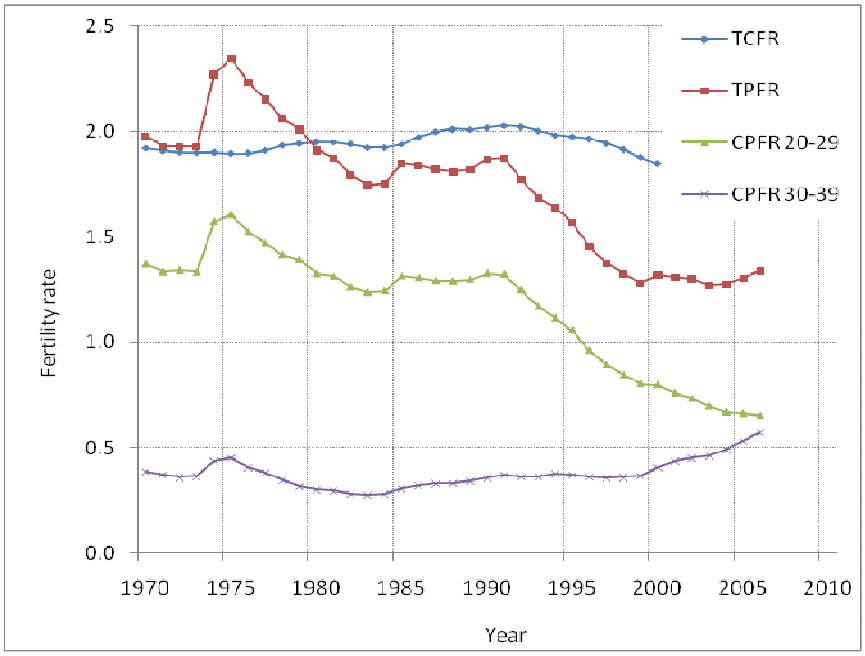
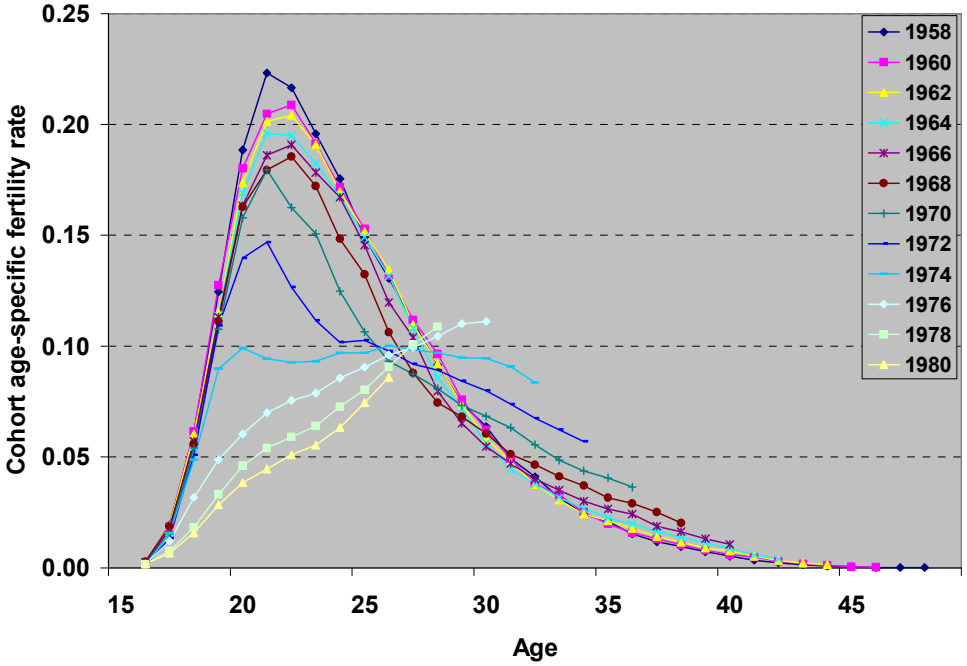
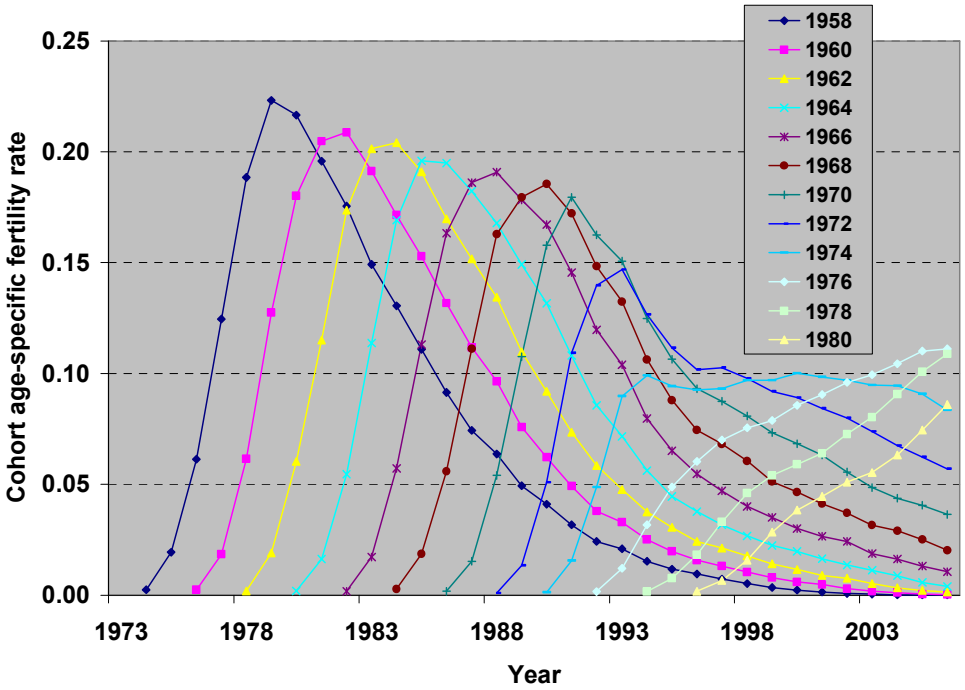


Figure 7 – Lifetime childbearing patterns, Czech Republic, birth cohorts 1958 to 1980

A. Childbearing shifts into higher ages



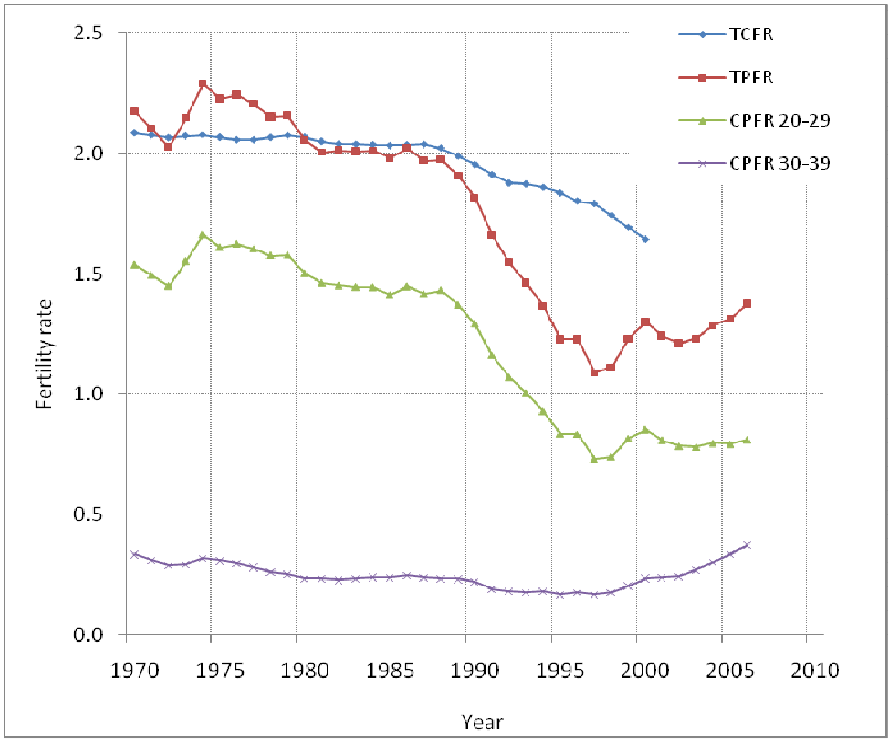
B. Succession of cohorts



Source: Observatoire Démographique Européen. 2010

Figure 8 - Total cohort fertility rate (lagged by 30 years), total period fertility rate, cumulative period fertility rates 20-29 and 30-39, Bulgaria and Russian Federation, 1970-2006

A. Bulgaria



B. Russian Federation

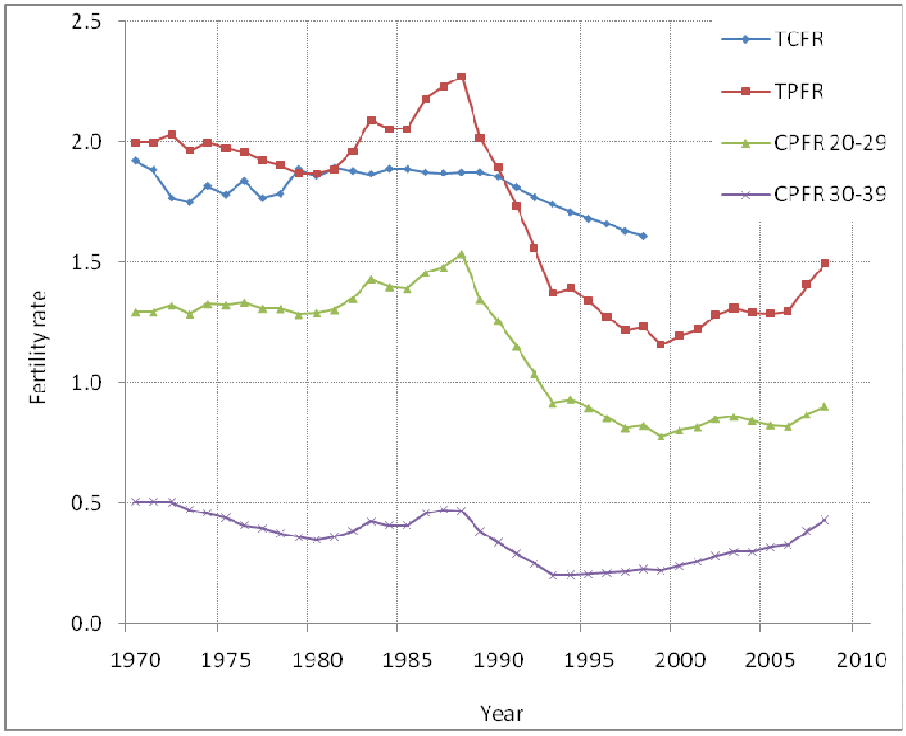
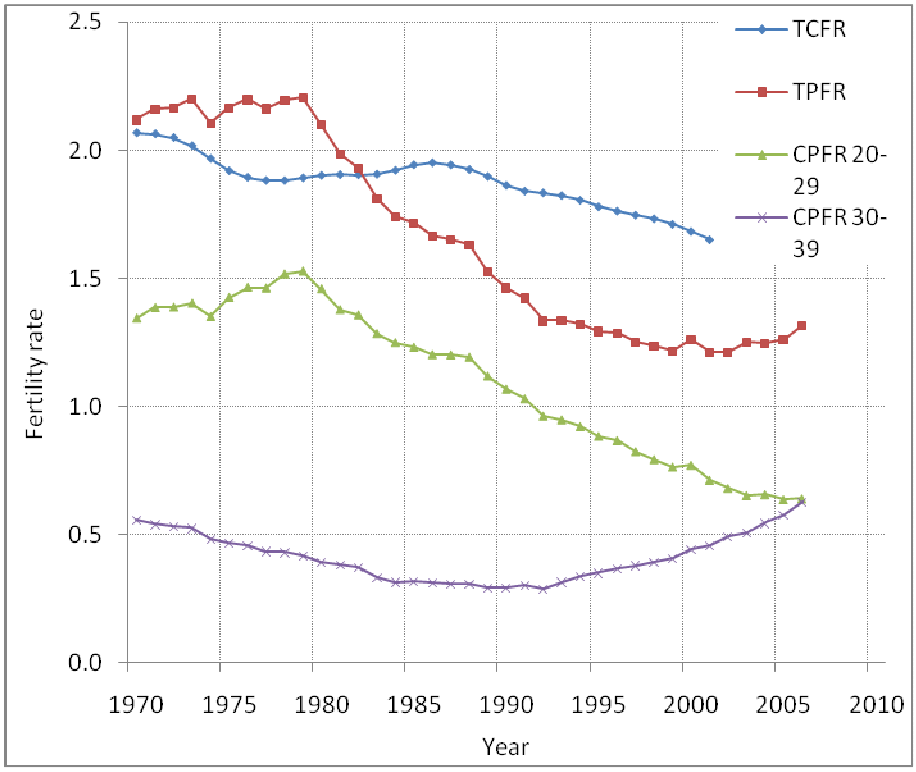


Figure 9 - Total cohort fertility rate (lagged by 30 years), total period fertility rate, cumulative period fertility rates 20-29 and 30-39, Slovenia and Croatia, 1970-2006

A. Slovenia



B. Croatia

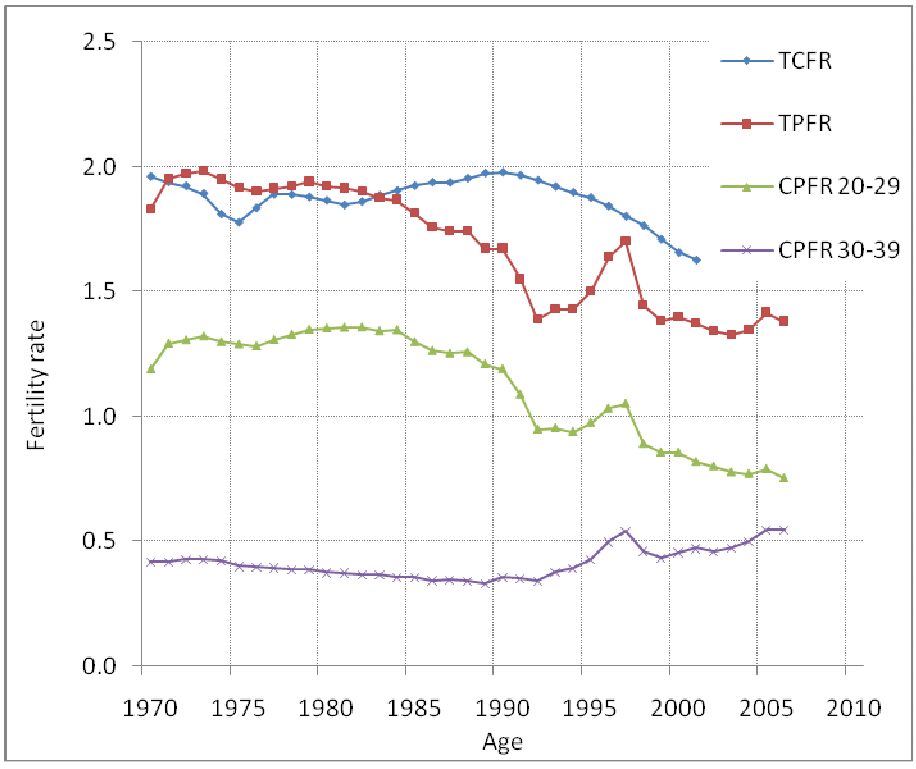
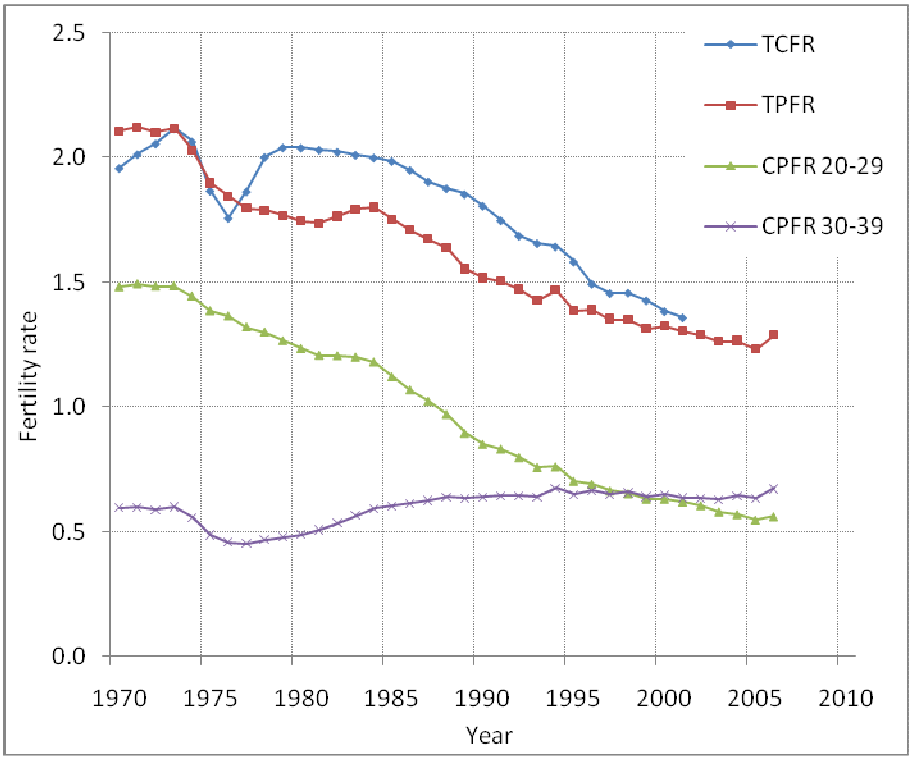


Figure 10 - Total cohort fertility rate (lagged by 30 years), total period fertility rate, cumulative period fertility rates 20-29 and 30-39, Japan and South Korea, 1970-2008

A. Japan



B. South Korea

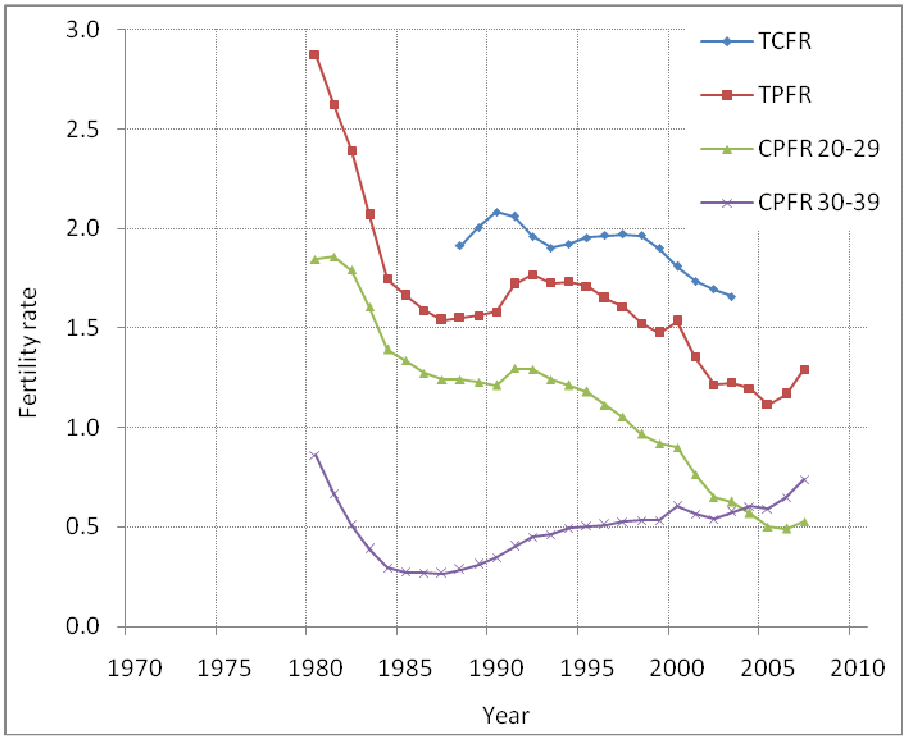
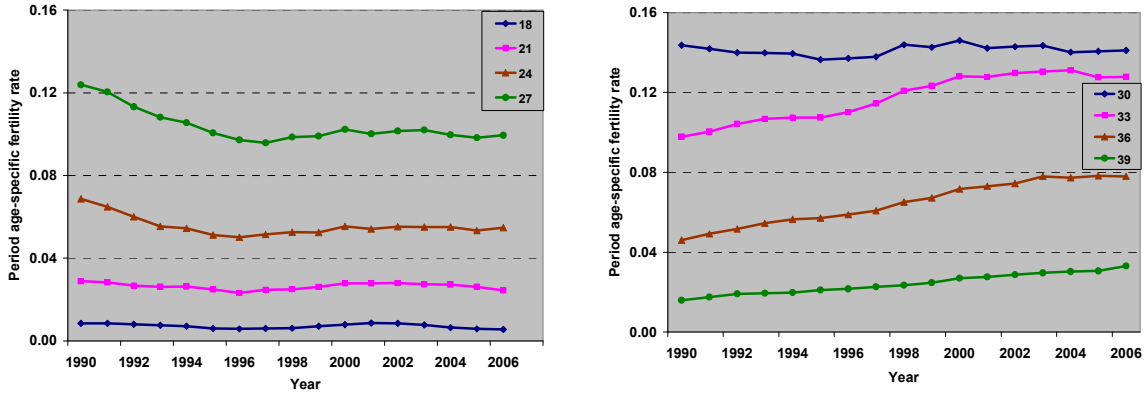
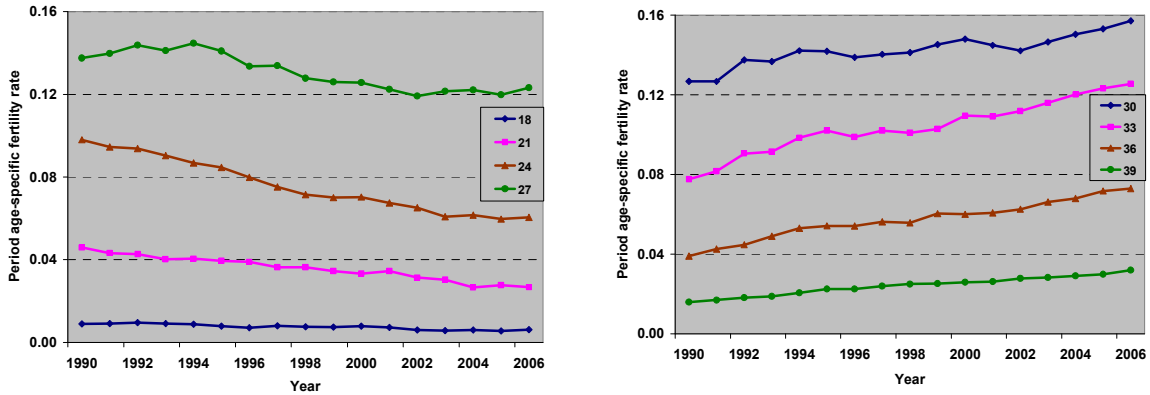


Figure 11 – Period age-specific fertility rates, The Netherlands, Denmark and New Zealand, 1990-2007

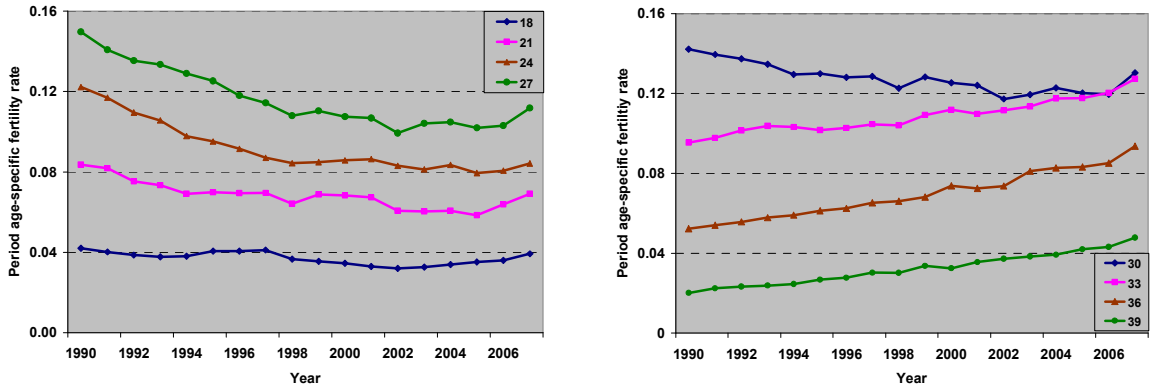
A. Period age-specific fertility rates, The Netherlands, 1990-2006



B. Period age-specific fertility rates, Denmark, 1990-2006



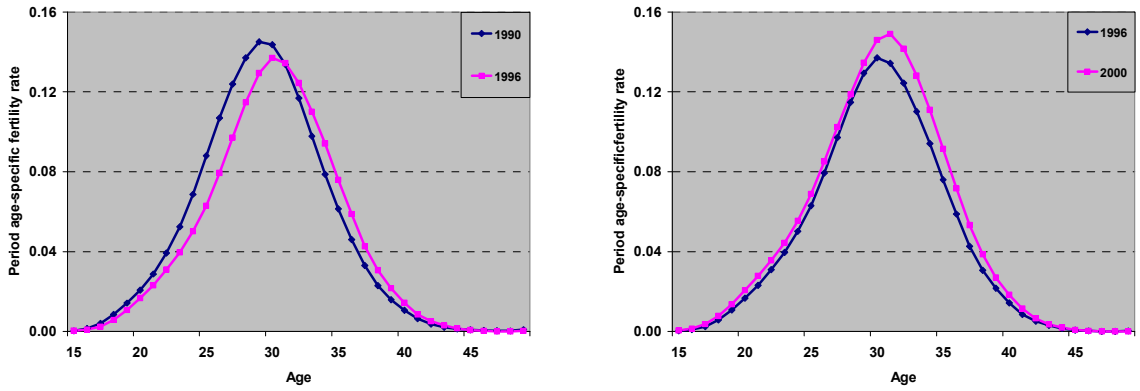
C. Period age-specific fertility rates, New Zealand, 1990-2007



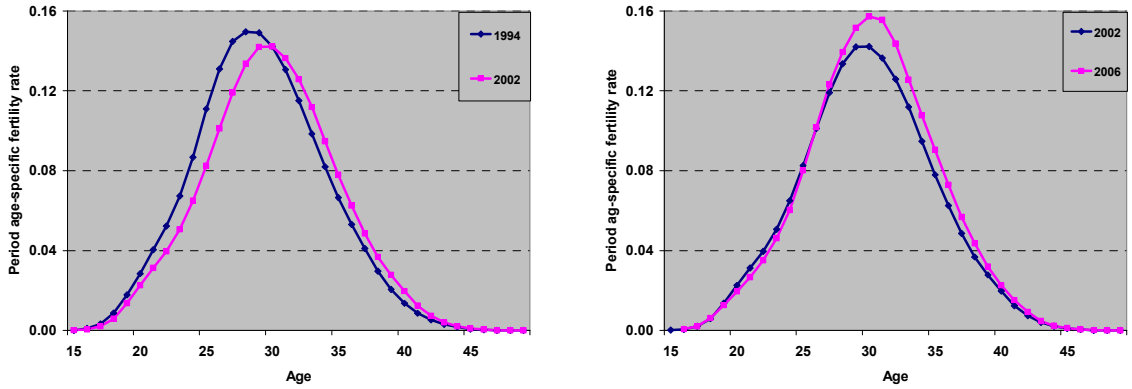
Source: Observatoire Démographique Européen. 2010

Figure 12 – Period age-specific fertility rates, The Netherlands, 1990, 1996 & 2000, Denmark, 1994, 2002 & 2006, and New Zealand, 1990, 1998, & 2007

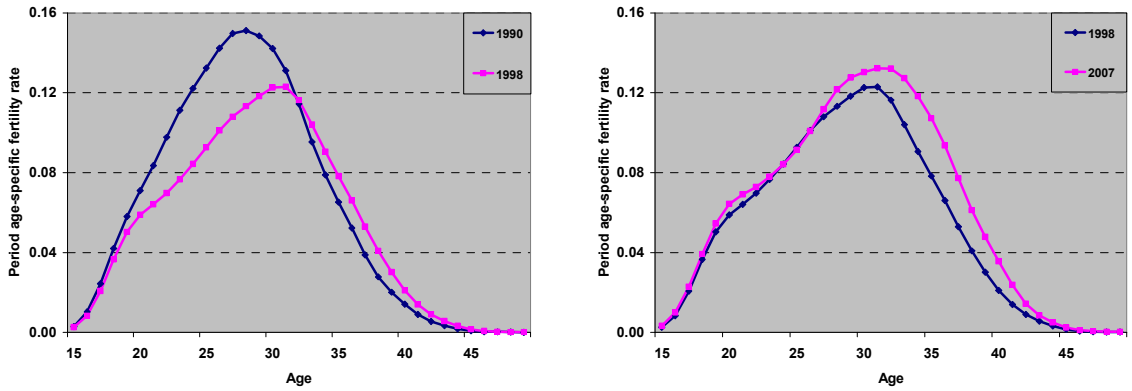
A. Age-specific fertility rates, The Netherlands, 1990, 1996 & 2000



B. Age-specific fertility rates, Denmark, 1994, 2002 & 2006



C. Age-specific fertility rates, New Zealand, 1990, 1998, & 2007



Source: Observatoire Démographique Européen. 2010