How Would “Tempo Policies” Work?
Exploring the Effect of School Reforms on Period Fertility in Europe

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Abstract

Governments and NGOs in many industrialized countries are concerned about the long-term demographic impacts of low fertility levels. We discuss how "tempo policies," reforms that shift the timing of childbearing, affect period and possibly cohort fertility levels. One such policy is a school reform that decreases the educational completion age, which could be achieved through an earlier school entrance age and compression of the school duration. Such policies are currently in focus in several low fertility countries, although for reasons not related to family issues. We show that a younger initiation of childbearing would have a rejuvenating effect on the age composition and increase the size of the population. Even if just the timing and not the levels of fertility increase, a younger timing of fertility could soften the trends of shrinking and ageing populations.

European Demographic Research Papers are working papers that deal with all-European issues or with issues that are important to a large number of European countries. All contributions have received only limited review.
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INTRODUCTION[1]

Governments and NGOs in many industrialized countries are concerned about the longer-term consequences of rapid population ageing on the pension systems, on the health system, as well as on intergenerational equity and global economic competitiveness. A recent prominent example is a study by the European Banking Federation in which the chief economists of over 4,500 commercial banks in Europe highlight the economic dangers of population ageing and state as the first of their three main recommendations: “Increasing the birth rate is particularly important...” (European Banking Federation 2004).

In demographic terms, the future path of ageing is determined by four forces: The current age structure of the population as well as the future paths of fertility, mortality, and migration. Of these four forces only two, migration and fertility, are, at least theoretically, candidates for possible government policies intending to counteract the massive ageing trend. The current age structure is a given and as far as mortality is concerned, only policies aimed at increasing life expectancy and hence reinforcing ageing are politically feasible and ethically acceptable.

Continued ageing is, to a large degree, pre-programmed in the current European age structure, where low birth rates over the past two decades have resulted in a small number of children and therefore decreasing numbers of potential mothers in the future. Because of this, Europe has already developed a negative momentum toward population shrinking (Lutz et al. 2003). Possible policies aimed at increasing fertility and/or increasing the volume of migration gain cannot be expected to reverse the ageing trend, but they could possibly weaken it and hence soften the expected negative consequences of ageing. Calculations based on the 15 member countries of the European Union (EU-15) in 2000 show that even in the case of a strong

[1] This paper was presented at the Population Association of America Annual Meeting, held in Boston, USA, April 1-3, 2004, in the session on “Fertility Policies” organized by Paul Demeny.

increase in immigration to 1.2 million net migration gain per year, the old age dependency ratio is likely to almost double by 2050. Similarly, even a strong hypothetical increase in fertility to 2.2 could not stop such significant ageing. Taken together, higher fertility and higher immigration can only moderate the ageing trend. In this context for the EU-15, it turns out that by 2050, 100,000 additional immigrants per year have the same demographic effect as a sustainable increase in the total fertility rate (TFR) by 0.1 children per woman (Lutz and Scherbov 2003).

In this paper, we focus on fertility-related policies and particularly on possible policies that are aimed at affecting the tempo of fertility, i.e., the effect that depresses the level of period fertility and hence lowers the number of births in a calendar year as long as the mean age of childbearing increases. In the next section we study the theoretical rationale for such tempo policies by discussing a) the possible demographic effects of a stop in the increase of the mean age of childbearing, and b) the political feasibility of such policies that would not aim at the number of children that couples choose to have (the quantum choice, which is largely seen as a private decision), but rather focus on the timing of these births. There are also important health reasons for trying to end a further increase in the mean age of childbearing, as well as social and economic welfare considerations. We will then look at the length of education as one of these social factors that is – for reasons other than fertility – currently the object of intensive policy considerations in many European countries.

In short, the question is whether current plans to shorten the average school duration and shift the timing of education towards younger ages (while still achieving the same degrees) could result in a force exerting downward pressure on the mean age of childbearing that would be significant enough to stop or substantially weaken the current fertility depressing tempo effect. We look first at empirical Swedish data that clearly show that the exact age at high school graduation has a significant effect on the average age at first and second birth. We then present some hypothetical calculations for Austria, Italy and Sweden, where a younger school entrance age and a shortening of education are currently being discussed, as well as for Bavaria, where it has recently been decided to shorten secondary school duration from nine to eight years. For both cases we find that such school reforms are likely to weaken the tempo effect and hence contribute to more births and slower ageing in the future. In the discussion section we consider other possible tempo policies that would not just shorten life cycle spans before childbirth, but possibly reorder the currently prevailing sequencing of events in adulthood by, e.g., encouraging student couples to have children.

RATIONALE FOR TEMPO POLICIES

This paper follows up on two recent papers and aims at concretising and operationalising the policy-relevant aspects of those papers. In March 2003, Lutz, O'Neill and Scherbov published an article in *Science* entitled "Europe's Population at a Turning Point." One of the key points made in this paper was that the current fertility depressing effect of an ongoing increase in the mean age at childbearing will have a significant and lasting effect on population dynamics in Europe, presenting a force towards population decline and accelerated population ageing. This so-called tempo effect on fertility has recently received much attention in the demographic literature (see, e.g., Bongaarts and Feeney 1998; Kohler and Philipov 2001). It is based on the analytical insight that fertility is currently low in Europe for two different reasons: 1) Women are delaying births to later ages, resulting in fewer births in the calendar years during which this delay happens; 2) even after adjusting for this tempo effect, fertility is below replacement level. If women do not forego postponed births altogether, delayed childbearing does not affect the total number of births women have over the course of their lives, but still lowers period birth rates as long as postponement is going on and hence contributes to further population ageing and decline. In real life not all postponed births will be recuperated, and increases in the mean age of childbearing also tend to reduce the quantum of the fertility of the concerned cohorts (tempo-quantum interactions).

In the context of tempo analysis, much of the demographic work so far has focused on estimating fertility rates that adjust for this tempo effect, seeing it as a disturbance that should be eliminated in order to come up with a “purer” fertility measure, the tempo adjusted TFR. Lutz et al. (2003) turn this approach upside down and focus on the tempo effect not as something that should be ironed out, but rather as something that is the focus of interest and could provide a point of leverage for possible attempts to influence the level of period birth rates, something called tempo policies. Quantitatively they show that at the level of the 15 member states of the European Union (EU-15) in 2000, a hypothetical end to postponement would bring the period TFR up from currently 1.5 to 1.8 over the coming 10-40 years and would significantly moderate future population decline and ageing. They also show that about 45 percent of the calculated population decline in their scenarios is due to the tempo effect. In terms of ageing it is shown that a continuation of the tempo effect for the next 10-40 years would imply that an additional 500 to 1.5 million person-years of workers would be needed to support the elderly population over the rest of the century, as compared with a no-delay scenario (hypothetical immediate end to the tempo effect). This clearly demonstrates that the changing age of childbearing represents a very important force of population dynamics in Europe that requires special attention. It is worth noting that tempo policies in the opposite direction, i.e., increasing the mean age at childbearing in order to speed up fertility decline in developing countries, has already been part of the demographic literature (see Bongaarts 1994).

In another recent paper, Goldstein et al. (2003) explicitly address another more methodological point in this context. Stable population theory says that under below replacement fertility conditions, a longer mean age of generation implies a slower shrinking of the population. This is a force in the opposite direction as compared to the tempo effect described above. What is the balance of these two opposing effects? The authors show both through analytical considerations as well as through a set of alternative simulations that the tempo effect by far outweighs the mean length of the generation effect for the coming centuries. The second effect would catch up only about 250-300 years into the future, if it is assumed that all postponed births are later recuperated. If one also includes estimates of tempo-quantum interactions, then the tempo effect becomes so overwhelming that the mean length of the generation effect can safely be disregarded. In other words, the above-mentioned aspect of stable population theory does not put into question the assertion that in actual European populations, a near term end to postponement or even a decrease in the age of childbearing would have significant demographic consequences in the direction of less shrinking and less ageing.

Although Lutz et al. (2003) are not very specific about how the suggested tempo policies could look, they discuss the political acceptability of policies following this line. Against the background that in contemporary Europe, explicitly pronatalistic policies meet pronounced public resistance, family policies in Europe today are based on an equal opportunity rationale and aim to help women combine childrearing with employment. With the possible exception of France, such policies in the past seem to have had little, if any, effect on period fertility (McDonald 2002; OECD 2003a), despite the very different family policies that countries apply when adjusting to the new economic and demographic realities (Gauthier 2002). Family policies aiming at the timing of births rather than family size may be more acceptable. Such policies would have an important health rationale in addition to a demographic rationale. A continued increase in the mean age of childbearing not only raises the risk of staying involuntarily childless, it also leads to burgeoning numbers of often cumbersome infertility treatments and increases the health risks associated with late pregnancies for both mothers and children. Hence, policies aimed at creating the conditions that allow women to have their children at an earlier age, or at least not being driven into further delays, could turn out to be win-win strategies, combining individual health concerns with public demographic concerns.

What public policies could help to stop the further increase in the mean age of childbearing or even lead to a decrease within the foreseeable future? There seem to be strong social and economic forces that work in the direction of ever increasing mean ages. The dominating view is that women want to finish their education first, then become established in a job and find a reliable long-term partner before they enter the demanding phase of raising children, which commits them for at least 15-20 years. And the standards of what is considered a satisfactory establishment in the professional career as well as what partnership is reliable enough to have children, seem to be continuing upward. How should such forces toward later childbearing possibly be reversed?

In theory, there are two different ways in which childbearing could come earlier in the female life cycle: One is a reordering of sequences (such as having children prior to finishing education); another is maintaining the usual sequence but shortening the phases that precede the birth of children (such as compressing the period of education). While the first amounts to a major change in social institutions and the widespread thinking of what is the preferred sequence of events, the second seems more realistic in contemporary Europe. Actually, for reasons entirely unrelated to the timing of births, efforts in many European countries are underway, that aim at lowering the age at which young men and women finish their secondary or tertiary education without lowering the average educational attainment of these cohorts.

In this paper we will focus on education reforms as a possible strategy to introduce a downward force on the mean age of childbearing.

AGE AT GRADUATION AND THE TIMING OF DEMOGRAPHIC EVENTS

Studies on the timing of events suggest that individuals tend to sequence events in adulthood according to rigid schemes: Leaving school precedes entering the labour market, having a child, and other events in adulthood (Billari et al. 2000; Blossfeld and De Rose 1992; Rindfuss et al. 1980). An increase/decrease in the age at graduation, particularly at the tertiary level, is likely to raise/lower the age of entering parenthood, because women usually postpone having children until they have completed their educational careers (Blossfeld and Huinink 1991). In effect, a change in the timing of one event is likely to affect the timing of subsequent events.

This effective incompatibility between education and childbearing seems to have become stronger over time, at least in the U.S. (Rindfuss et al. 1996). This implies that graduating from school is increasingly important for fertility decisions. Furthermore, even in countries where parental benefits aim at making it easier to combine having children with being a student, such as Norway, being enrolled in education still suppresses the probability of childbearing (Kravdal 2001), indicating that fertility choices during education are not strongly influenced by public policies.

Over the past decades the increasing lengths of education have had substantial effects on fertility patterns. As educational attainment has increased during the last decades, the mean age at childbirth in most European countries has increased considerably, and total fertility rates have dropped below replacement levels (Council of Europe 2001). For example, in Sweden, the mean age at first birth increased from 26.3 (1990) to 27.9 (2000), while TFR fell from 2.14 to 1.54. When discussing changes in the length of education and in the average age at graduation, it is important to distinguish between the changing age at which a certain level of education is completed and the change in the average level of educational attainment. Both factors have recently moved upwards.

Educational reforms that decrease the age of leaving school are currently underway, or are being planned, in several European countries. School regulations can affect the graduation age by a) compressing or extending the school duration required for a specific educational degree, or b) changing the age of entering school, which for a given schooling period would alter the graduation age.

Changes in the required school duration are currently underway across Europe, where, for example in Italy, tertiary education is now being shortened in order to adhere to the European standards given in the Bologna

Declaration 1999.[2] At the secondary level, the German *Bundesland* Saarland shortened academic track school duration from nine years to eight years in 2001, and several other *Bundesländer*, including Bavaria, are implementing similar policies. School shortening reforms are implemented in order to increase the flow of students through the system, to increase the supply of labour for the economy, and to improve the cost-effectiveness of the educational system. Possible fertility effects of these reforms on the level of period fertility have so far not been addressed.

The age at entering school also varies, and can be as young as four or as old as eight years according to the country (UNESCO 2003). When German and Italian children enter school the year they turn six, their counterparts of the same age from Holland, England, Scotland, and Wales are already in their second year of school; in Luxemburg and Northern Ireland they are in their third year, while six year-olds in Denmark and Finland still have one year to go before they start to attend school.

The school entrance age has in recent years been changed towards younger entrance ages in several countries. In Sweden the school entrance age was lowered in the 1990s, after regulations on the age of school entrance were liberalized. Only seven of the American states required enrolment in school below the age of seven in 1965, while in 1992, 25 states did so (U.S. Department of Health, Education and Welfare 1965; Education Commission of the States 1994). Moreover, a recent, industry-sponsored German proposal (Lenzen 2003) suggested lowering the school entrance age to four years and reducing the typical school duration to 10 years, in order to lower the age of exiting the educational system.

Several other influences affect the duration between graduation and fertility decisions. These include the role of social norms for when to enter the labour market, the influence of the family in providing financial support to the children, as well as the degree of real wage flexibility, which affects

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[2] Information available under
http://www.bologna-berlin2003.de/pdf/bologna_declaration.pdf

the likelihood of employment (Bentolila and Ichino 2000; Planas 1999; OECD 1999, 2000). However, the speed of the transition to adulthood, including unemployment spells and time spent out of the workforce, is not affected by whether the average school leaving age is low or high. International comparisons suggest that the transition from education to the labour force is not affected by the age of leaving school (OECD 2003b; UNESCO 2004).

EMPIRICAL ANALYSIS OF THE FERTILITY EFFECTS OF SCHOOL LEAVING AGE: THE CASE OF SWEDEN

Women who attain higher education tend to have fewer children and have them at a later time, but the non-random educational sorting makes drawing conclusions about the causal nature of this relationship difficult. Women with older/younger age at leaving school tend to have different levels of education as well; therefore, they differ by unobserved characteristics that affect both educational attainment and fertility decisions, such as preferences, abilities, opportunities, and family background. To identify the causal effects of a change in the school leaving age, we present a study based on a natural experiment[3] that produces variation in the explanatory variable (graduation age) that is uncorrelated with other influences on fertility.

Skirbekk et al. (2004) analyse a dataset of 863,304 non-immigrant Swedish women born between 1946-1962 and utilize the fact that Swedish children are enrolled in school in the calendar year in which they become seven years old. Therefore, children who are born during two consecutive months, December and January, differ by 11 months in the age at graduating from school, although they are born merely one month apart.

This institutional setting of the Swedish school system results in an exogenous variation in the age at completing compulsory or higher

[3] For a discussion of the use of natural experiments, see Rosenzweig and Wolpin (2000).

education, assuming that parents cannot time the births of their children very accurately to the exact month. Birth months affect age at graduation in the same way as a random sorting of individuals into higher and lower school leaving ages. This setting is, therefore, well suited to investigate the causal link between the timing of fertility and variation in the school leaving age.

Skirbekk et al. find that variation in the school leaving age has a strong and consistent effect on the timing of demographic events in adulthood. An 11-month higher school leaving age, that is the difference between women born in December and January the *following* year, results in a 4.9 month later age at first birth. In Figure 1 this pattern is shown for the four quarters of the year, indicating a very clear downward slope and a difference of 3.1 months between the first and the fourth quarter *within* a year.

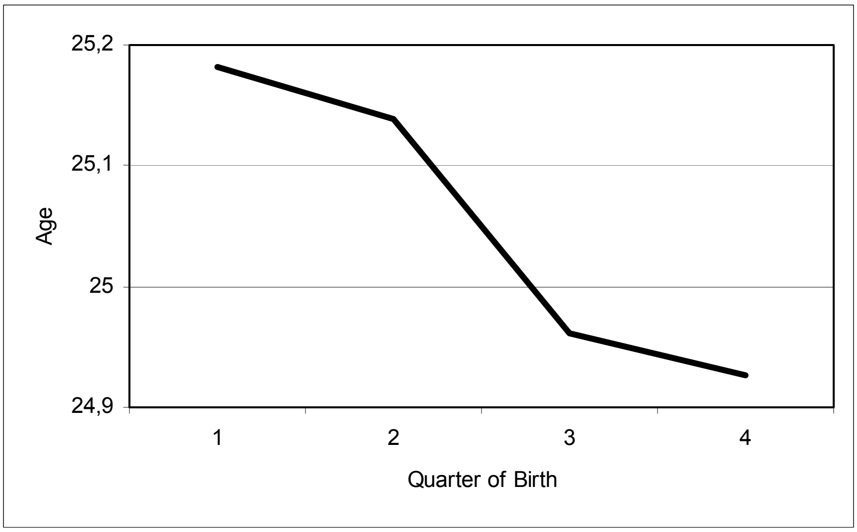

Figure 1 Age of mother at birth of first child for Swedish women born 1946-1962.

The timing of the second birth is also affected by the school leaving age. The birth interval between the first and the second child remains virtually unchanged in response to variation in the age at first birth caused by different years of graduation. There is almost no difference in birth intervals between women born in the four quarters of the year, indicating that there is no conscious compensation for birth-month induced variation in the age at first birth. These findings suggest that important timing aspects of fertility are strongly connected to the time since leaving school, and that the childbearing age is strongly influenced by the fertility patterns of one's former classmates.

A school reform that lowers the school leaving age will in addition to affecting the *individual's biological age* at the time of school exit also affect the *social age* of the social reference group (the class peers). The experiment conducted by Skirbekk et al. illuminates some fertility effects of a shock to the individual's school leaving age, but not those stemming from a change in the social age of the school cohort.

A lower age at graduation would increase the social age of those affected, which would increase the effect of a younger school leaving age on the timing as well as the quantum of childbearing through tempo-quantum interactions: The impact of a more "mature" social influence at a younger biological age would heighten the probability of having children at a younger age. This could in turn imply an increase in cohort fertility. A change in the school leaving age is likely to have a stronger influence on the timing of fertility than the one identified in the Swedish birth month experiment, since *both* biological *and* social age at the time of graduation matter for fertility decisions. Taken together, a not implausible assumption would be that a one-year change in the school graduation age would be reflected in a unit shift in the age of entering parenthood. But we will also experiment with other assumptions.

HYPOTHETICAL FORECASTS FOR AUSTRIA, BAVARIA, ITALY AND SWEDEN

In order to investigate the possible demographic impacts of a change in the timing of fertility, we project the consequences of fertility changes for the young cohorts in Austria, Italy, Sweden, and the German state of Bavaria, which with 13 million inhabitants is bigger than many European countries.[4] We assume zero net migration for all four regions. Life expectancy is assumed to increase by 1.5 years per decade; that means 11.25 years for the 75-year duration, from 2000 to 2075. In Austria, life expectancy increases from 81.5 to 92.8 for women and 75.7 to 87 for men; in Bavaria from 79 to 90.3 for women and 73 to 84.3 for men; in Italy from 81.6 to 92.9 for women and 75.8 to 87.1 for men; in Sweden from 82 to 93.3 for women and 77.5 to 88.8 for men.

In the following we will discuss five different scenarios that are based on different assumptions with respect to the future course of period TFR. In all cases where the effect of a school reform (resulting in an assumed lower mean age of childbearing) is being simulated, we assume that the reform first affects the female birth cohort of 1995. Hence, the effect on the period TFR will only be gradual and increase as more and more of the women born after 1995 move into the main reproductive ages. For the cohorts born before 1995, the rates are assumed to stay constant at the level described in the specific scenario assumptions. The assumed TFRs for the four populations are plotted in Figures 2a-2d.

First, we consider a constant period TFR scenario (Scenario 1). It presents a reference case for comparison, in which all age-specific period fertility rates remain constant throughout the projection period. Substantively, this scenario assumes that current postponement continues. Since postponement cannot continue forever, it also implies that as the

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[4] Sources of data: Statistics Austria, Bayerisches Landesamt für Statistik und Datenverarbeitung, ISTAT and Statistics Sweden.

tempo effect gets weaker, this will be compensated by a declining quantum in order to produce a constant period TFR.

The next scenario refers to the hypothetical case of constant tempo-adjusted period TFR (Scenario 2) at the current level. Here we assume that period fertility immediately jumps to the level of tempo-adjusted fertility, assuming an instant end to further delays in childbearing. These rates are then held constant over time. To estimate the adjusted tempo effect, we apply the Lutz et al. (2004) estimate for a general relationship between an increase in the mean age of childbearing and the tempo effect. It shows that on average in contemporary Europe, an increase in the mean ages of childbearing (over all birth orders) of 0.1 years depresses the period TFR levels by 0.19 children. Lutz et al. base this estimate on data from European countries from 1980-2000. Applying this estimate and taking into account the changes in the mean age of childbearing,[5] the Austrian tempo-adjusted fertility is 1.69 and the unadjusted TFR in 2002 is 1.41. In Bavaria, the tempo-adjusted fertility is 1.62 and the unadjusted TFR in 2002 is 1.36. In Italy, the tempo-adjusted fertility is 1.51 and the unadjusted TFR in 2000 is 1.24. In Sweden, the tempo-adjusted fertility is 2.08 and the unadjusted in 2002 is 1.70.

Next we consider a scenario reflecting a specific school reform (Scenario 3). In this scenario we consider the case of a school reform that has the net effect of reducing the mean age of childbearing by two years for the cohorts born 1995 or later. This is implemented by a simple downward shift in the age-specific fertility profile for the cohorts concerned. This effect

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[5] The Austrian annual rise in the mean age of childbearing is estimated to be 0.15 years, which is calculated as the average annual change from 1997 to 2000. The Bavarian annual rise in the mean age of childbearing is 0.138 years, which is calculated as the average annual change from 2001 to 2002. The Italian annual rise in the mean age of childbearing is 0.142 years, which is calculated as the average annual change from 1991 to 2000. The Swedish annual rise in the mean age of childbearing is 0.165 years, which is calculated as the average annual change from 2000 to 2003.

is clearly stronger than what one would expect from a shortening of the educational period by one year. It might be seen as close to representing the case in which the average school leaving age drops by two years because of a school reform, which might be the result of a lower school entrance age, or a compressed education, or a combination of both. Since we do not have sufficient evidence for assuming a certain quantitative relationship between a lower age of leaving school and a lower mean age of childbearing (see discussion above), we found it safer to make the assumptions in terms of a certain assumed shift in the age pattern of fertility. The effect of a one-year decline in the mean age of childbearing would be half of the effect calculated under this scenario.

The next scenario studies the case of a school reform with quantum effect (Scenario 4). Here the likely possibility of a tempo-quantum interaction on fertility is investigated, where the cohorts affected by the school reform are not only younger at the time of childbearing, but also increase fertility outcome levels.[6] We base our estimates on Kohler et al. (2001), who find that a one-year earlier initiation of childbearing increases cohort fertility by three percent. Given the school reform that causes a two-year drop in the age at first birth, this would lead to a six percent higher fertility in the "reform with quantum effect" scenario.

Finally, we consider a fifth scenario, which looks at the case of a school reform with quantum effect on top of Scenario 2 (Scenario 5). Here we simply assume that the reform does not affect a society that is otherwise continuing the delay of childbearing (as assumed in Scenario 1), but we look at the hypothetical case that postponement would come to a natural end (Scenario 2) and the effect of the school reform, including the effect of

[6] This result may be compatible with the results from Skirbekk et al. (2004) who find no impact on fertility outcome of a lower/higher biological age when leaving school. This is due to the fact that a decrease in the school leaving age would also increase the individual's social age, which could lead to higher cohort fertility levels.

possible associated tempo quantum interactions, would come on top of this. Clearly, this scenario has the highest assumed future fertility rates. Table 1 presents a summary of the five scenarios.

Figures 2a-d show the trends of period TFR that underlie the five scenarios. In order to allow the study of long-term implications of these assumptions, the time horizon goes until 2075. Figure 2a gives the period fertility levels for Austria, 2b for Bavaria, 2c for Italy, and 2d for Sweden.

Figures 3a-d give the results in terms of the series of absolute numbers of births. The overall trend is clearly declining for all scenarios in Austria, Bavaria and Italy. This is because fertility, even under the highest scenarios, will still be below replacement level and because smaller cohorts of women will enter the reproductive ages as a consequence of the low fertility in the past (the negative momentum of population growth). In Sweden (see Figure 3d) where the TFR is currently around 1.7 and the age distribution is even younger, the calculated scenarios partly result in an increase in the absolute number of births and the size of the population. Austrian period fertility (Figure 3a) is similar and currently around 1.41.

Figures 4a-d show the old age dependency ratio for the four populations and the different scenarios. Since this ratio is defined as the population above age 65 divided by the population aged 15-64, one would only expect a delayed effect of changes in the births series. And indeed the four Figures (4a-d) show a visible variation among scenarios beginning only around 2030. After that the differences turn out to be quite sizable. In Bavaria and Italy, the lowest fertility scenarios (Scenarios 1 and 3) result in old age dependency ratios that increase to above 0.7 and 0.9 by 2075, whereas in the cases of a declining mean age of childbearing, presumably as a consequence of school reform combined with a natural end of the tempo effect, these ratios would increase to 0.5 and 0.7.

Figures 5a-d give the implications for changes in total population size due to these fertility changes under otherwise identical mortality and migration assumptions. For Austria, Bavaria and Italy, none of the scenarios can stop the significant population decline that is implied by the declining number of births as described above. But the extent of decline is still surprising, even when one considers that this is for a closed population (assuming no migration) and constant mortality. Under all scenarios but one, the population of Bavaria would decline from currently around 12 million by at least a third by 2075. Only the combination of a significant school reform with a natural end to the tempo effect will result in 8.5 million. For Italy, the picture is even a bit more extreme. But the point of this exercise is not to look at absolute changes (for this we need realistic migration assumptions), but rather to compare the scenarios and study the relative impacts of possible school reform effects. In Sweden, the situation is less drastic, and two of the scenarios (S 2 and S 5) predict an increase in the size of the population until 2075. Table 2 presents the results of the five scenarios for Austria, Bavaria, Italy and Sweden in numerical form.

In summary, the tentative scenarios presented in this section clearly indicate that changes in the age of childbearing (here operationalised as a two-year change) that can be the result of school reforms have significant long-term effects on population dynamics. If we compare the constant period TFR scenario (scenario 1) with the school reform with quantum effect scenarios (scenario 4), then we see that the absolute number of births over the coming decades is likely to be 8-16 percent higher in the case of school reform. In terms of total population size and the old age dependency ratio, the long-term differences due to an assumed education reform (even without a natural end to the tempo effect) are at the order of 5 to 10 percent. Considering what a single percentage point means in terms of expenses for social security, these are indeed very significant long-term impacts that make a closer analysis of the effects of school reform on the mean age of childbearing a worthwhile effort.

Table 1 Scenario description.

Scenario	Tempo adjustment	Educational reform – 2 years younger school leaving age	Fertility outcome level
S 1	No	No	Constant
S 2	Yes	No	Constant
S 3	No	Yes, childbearing shifts 2 years toward younger ages	Constant
S 4	No	Yes, childbearing shifts 2 years toward younger ages	Increases by 6%
S 5	Yes	Yes, childbearing shifts 2 years toward younger ages	Increases by 6%

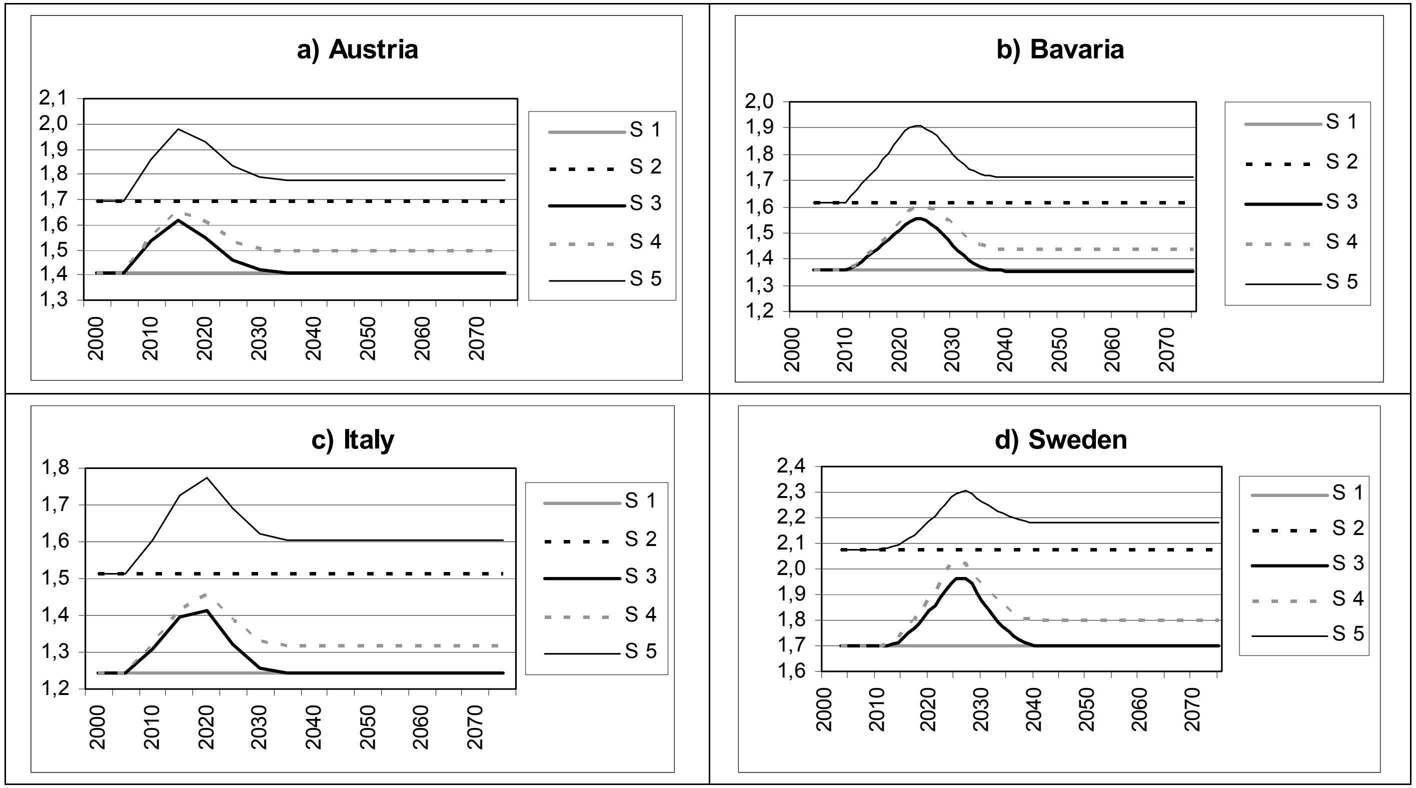

Figure 2 Total fertility rate under the five alternative scenarios.

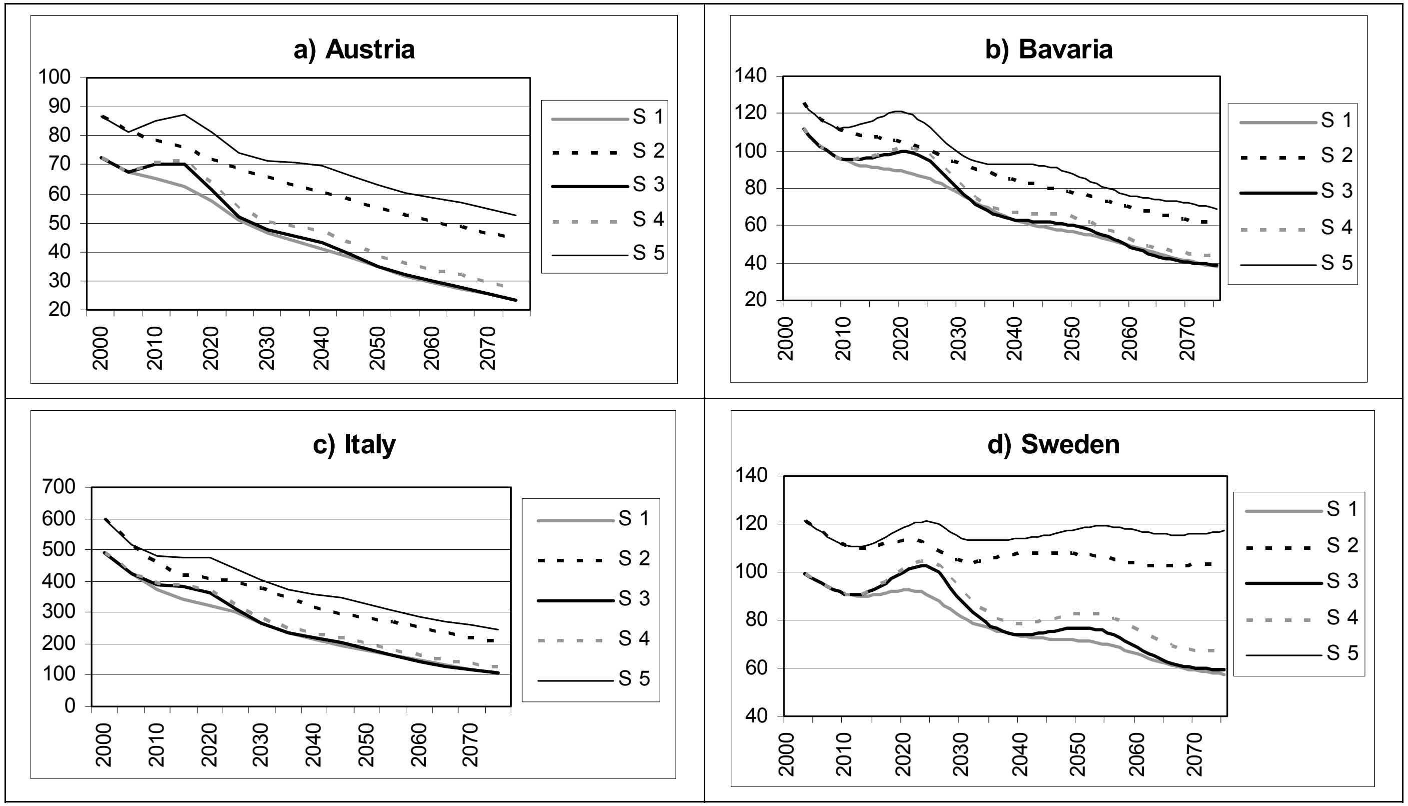

Figure 3 Number of births (in thousands) under the five alternative scenarios.

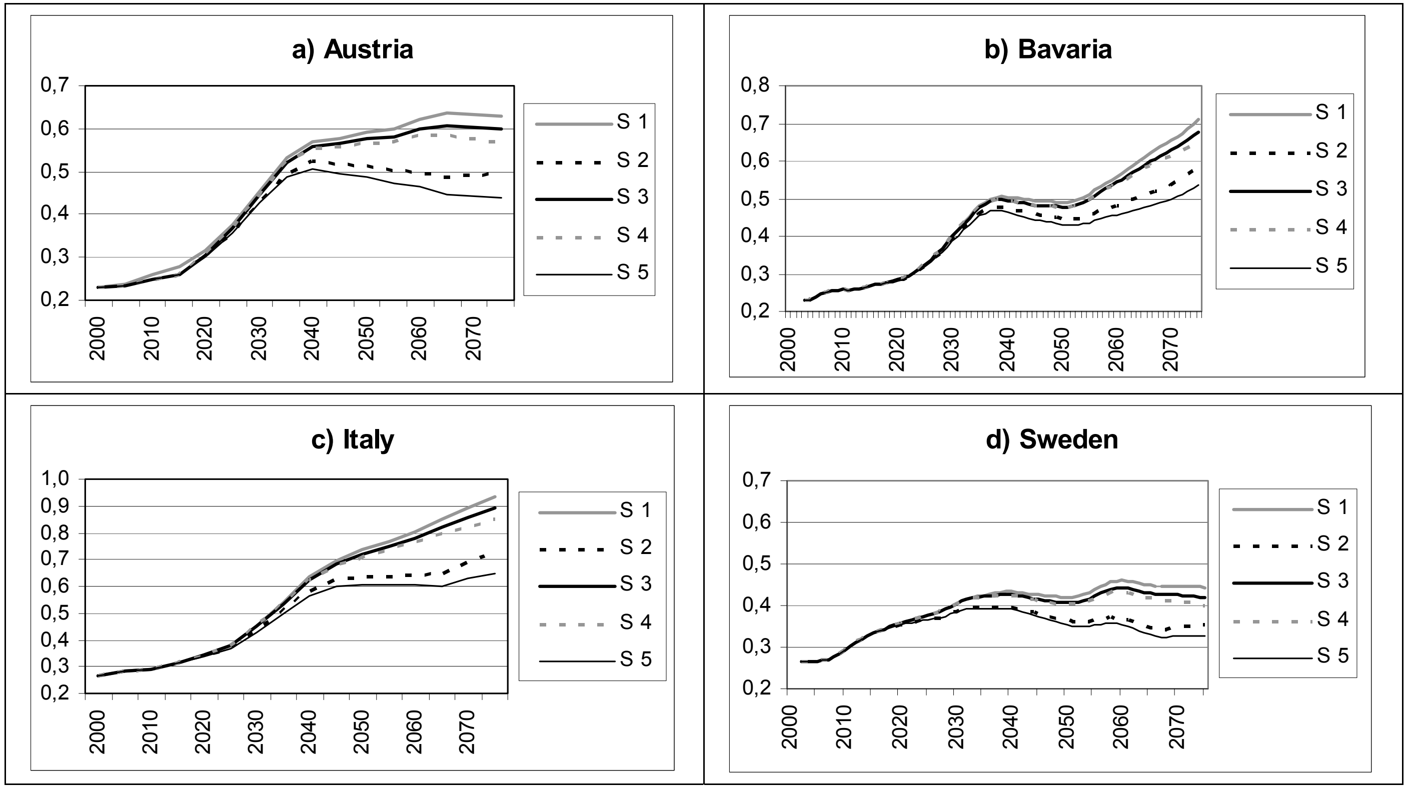

Figure 4 Old age dependency ratio (65/15-64 year olds) under the five alternative scenarios.

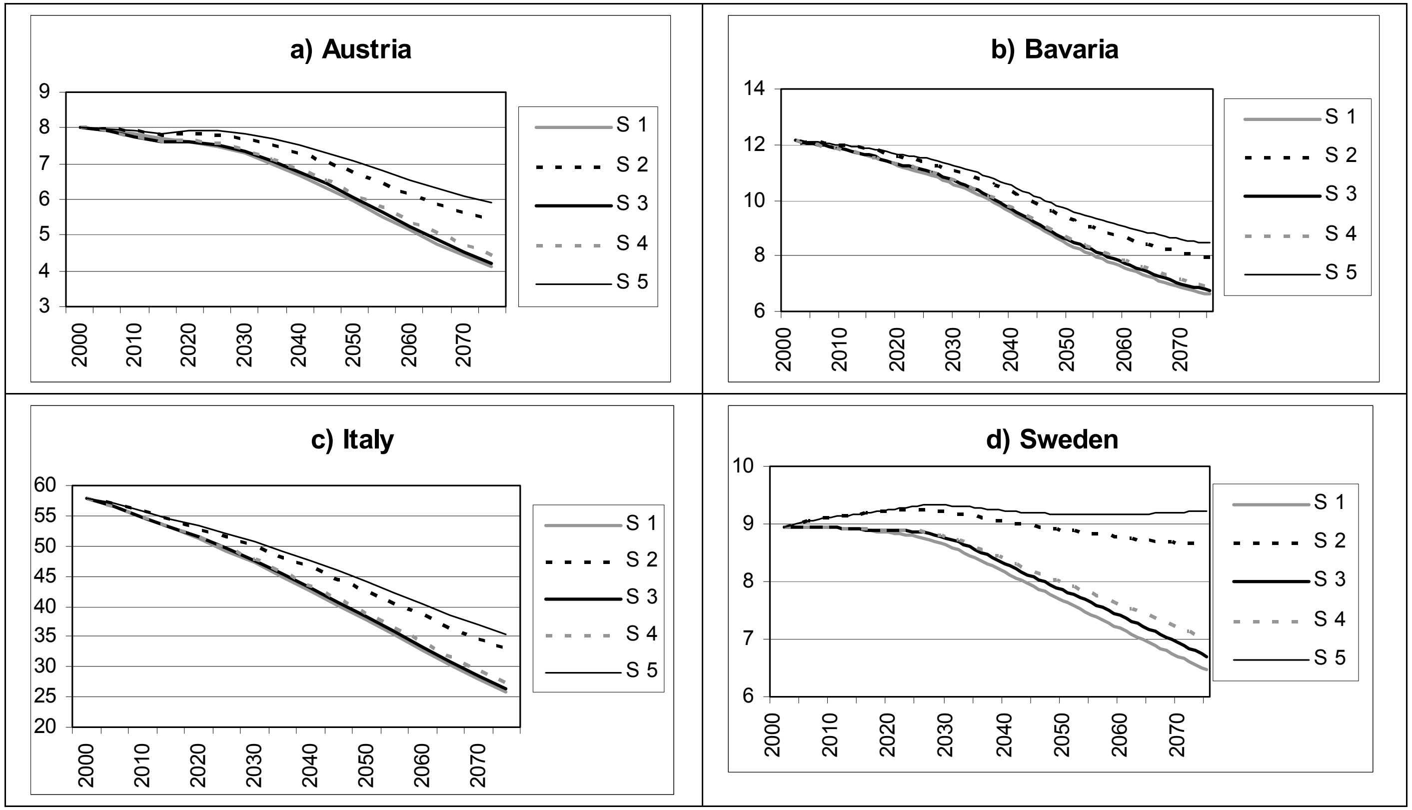

Figure 5 Population size (in millions) under the five alternative scenarios.

Table 2 Results of the five scenarios for Bavaria, Italy, and Sweden in numerical form.

	Scenario	2005	2025	2050	2075
Total fertility rate					
Austria	S 1	1.41	1.41	1.41	1.41
	S 2	1.69	1.69	1.69	1.69
	S 3	1.41	1.46	1.41	1.41
	S 4	1.41	1.54	1.49	1.49
	S 5	1.69	1.83	1.78	1.78
Bavaria	S 1	1.36	1.36	1.36	1.36
	S 2	1.62	1.62	1.62	1.62
	S 3	1.36	1.55	1.36	1.36
	S 4	1.36	1.60	1.44	1.44
	S 5	1.36	1.88	1.71	1.71
Italy	S 1	1.24	1.24	1.24	1.24
	S 2	1.51	1.51	1.51	1.51
	S 3	1.24	1.32	1.24	1.24
	S 4	1.24	1.39	1.32	1.32
	S 5	1.51	1.65	1.60	1.60
Sweden	S 1	1.70	1.70	1.70	1.70
	S 2	2.08	2.08	2.08	2.08
	S 3	1.70	1.96	1.70	1.70
	S 4	1.70	2.03	1.80	1.80
	S 5	1.70	2.04	2.18	2.18
Births					
Austria	S 1	67,357	51,067	34,761	23,438
	S 2	80,978	68,645	55,224	44,369
	S 3	67,357	52,012	35,015	23,052
	S 4	67,357	54,773	39,030	27,259
	S 5	80,978	74,139	62,808	52,453
Bavaria	S 1	105,283	85,088	56,496	38,195
	S 2	119,303	99,924	77,811	60,610
	S 3	105,283	94,232	60,039	38,667
	S 4	105,283	97,366	64,513	43,497
	S 5	119,303	112,575	87,652	68,939
Italy	S 1	424,924	299,348	179,841	109,348
	S 2	517,338	397,738	283,185	206,216
	S 3	424,924	309,699	183,526	107,902
	S 4	424,924	324,453	202,305	125,561
	S 5	517,338	439,570	328,850	246,516
Sweden	S 1	96,657	89,359	71,589	57,472
	S 2	118,299	110,319	107,581	103,722
	S 3	96,657	101,459	76,835	59,578

	S 4	96,657	104,235	82,766	67,600
	S 5	118,299	120,816	118,073	117,230
Old age dependency ratio					
Austria	S 1	0.24	0.26	0.59	0.60
	S 2	0.23	0.25	0.51	0.50
	S 3	0.23	0.25	0.58	0.58
	S 4	0.23	0.25	0.57	0.57
	S 5	0.23	0.25	0.49	0.47
Bavaria	S 1	0.24	0.32	0.49	0.71
	S 2	0.24	0.32	0.45	0.58
	S 3	0.24	0.32	0.48	0.68
	S 4	0.24	0.33	0.48	0.65
	S 5	0.24	0.32	0.43	0.54
Italy	S 1	0.28	0.38	0.73	0.93
	S 2	0.28	0.37	0.63	0.72
	S 3	0.28	0.38	0.72	0.89
	S 4	0.28	0.38	0.71	0.85
	S 5	0.28	0.37	0.61	0.65
Sweden	S 1	0.27	0.40	0.53	0.71
	S 2	0.27	0.39	0.46	0.55
	S 3	0.27	0.40	0.51	0.67
	S 4	0.27	0.40	0.51	0.64
	S 5	0.27	0.39	0.45	0.51
Population					
Austria	S 1	7,931,326	7,493,667	5,933,742	4,103,660
	S 2	7,983,362	7,801,698	6,745,046	5,396,296
	S 3	7,910,378	7,540,904	6,050,289	4,219,802
	S 4	7,910,378	7,561,625	6,153,934	4,424,651
	S 5	7,983,362	7,938,598	7,061,539	5,902,589
Bavaria	S 1	12,036,100	10,947,896	8,423,244	6,609,296
	S 2	12,094,979	11,348,709	9,334,737	7,962,561
	S 3	12,036,100	11,056,722	8,573,865	6,759,221
	S 4	12,023,897	11,058,541	8,640,079	6,914,506
	S 5	12,096,228	11,498,655	9,663,439	8,463,988
Italy	S 1	56,424,447	49,215,330	37,722,539	25,857,855
	S 2	56,955,415	51,399,766	42,489,430	32,981,525
	S 3	56,424,447	49,670,702	38,285,858	26,360,381
	S 4	56,424,447	49,758,931	38,774,180	27,292,523
	S 5	56,954,750	52,130,121	44,105,431	35,471,643
Sweden	S 1	8,955,054	8,775,288	7,674,566	6,461,016
	S 2	9,020,697	9,250,914	8,902,594	8,643,211
	S 3	8,955,054	8,861,661	7,855,478	6,703,930
	S 4	8,955,054	8,875,818	7,983,362	7,011,216
	S 5	9,020,697	9,313,141	9,171,672	9,231,095

DISCUSSION

Tempo policies are a new concept, and possibly a powerful and socially acceptable way to increase period fertility rates where they are considered to be too low. As discussed in Lutz et al. (2003) and Goldstein et al. (2003), this concept is based on a sound demographic rationale, but is far from mature in terms of its possible social operationalisation. In this paper we tried to focus on education reforms that lead to a younger mean age at graduation for a given degree as one possible form of tempo policy. Such reforms are currently being discussed in order to improve the supply of skilled young labour and to reduce the social cost of education (which in itself would be a win-win strategy). If these reforms would help to stop the trend toward ever increasing mean ages of childbearing, which is desirable for both individual health and aggregate demographic reasons, this would actually represent a multiple win strategy. But clearly more work is needed to substantiate this claim. The purpose of this paper is to propose the approach and initiate a discussion that hopefully will result in many more contributions.

Low period fertility is not only of concern in Europe. Several Asian countries have TFRs of below 1.5 and are confronted with the prospect of significant population ageing as a consequence. The concern about low fertility has been particularly pronounced in Singapore. Over the last years the government of Singapore has implemented several policy packages, including tax cuts, housing support and cash benefits, that are explicitly pronatalist in a way that would make them not easily acceptable in Western Europe. With current (2002) TFR at 1.37, that of the Chinese population majority at 1.18, and that of women with tertiary education below 0.8, fertility differentials are also a major concern. Unfortunately we do not have the data to assess the extent to which this very low fertility is due to a tempo effect. But there is evidence that fertility postponement is very strong among the more highly educated women in Singapore and therefore, we expect a strong tempo effect. Because past pronatalist policy packages did not result in fertility increases and period fertility continued to fall, the prime minister of Singapore set up a special task force under his supervision to deal with the issue of low fertility. With the high political priority assigned to the issue and a past record of rather strong government influence on private lifestyle, Singapore may be a candidate for trying to implement policies that not only shorten the periods of education to a given degree, but actually try to reverse the life cycle sequence of parts of the younger cohorts. In Singapore childbearing is (still) universally within wedlock and marriage is typically postponed until the couple can afford an apartment, which means that they must have made some money in the labour market first. In this context providing student couples who are ready to marry and have children with subsidized campus housing and childcare to actually be able to meet their child desires may well result in an increase in student fertility. One would expect that during study time, young parents may have more flexibility for arranging their days and accommodating childcare than in the case of both partners trying to fight their way up in competitive companies.

The reordering of the currently rather rigid life cycle sequencing could, of course, also be considered for the rest of the low fertility world. One may think of a lot of reasons for such reordering: Doctors tell us that from a purely physiological perspective the best age of childbearing is 20-25. So much on the health rationale. What about the stability of partnership and divorce as factors in this rationale? It is often argued that a lower age at marriage means a higher risk for divorce and hence is potentially harmful to the children. While it is true that marriages below age 20 show a higher risk of divorce, this is less clear for marriages in the low and mid-20s (Lutz et al. 1991). In any case, with increasing rates of non-marital unions and non-marital fertility, this issue becomes less relevant. Also, the divorce rates which are well above 50 percent in many European cities seem to be driven by many other factors for which it is not necessarily advantageous to have children late in life. If a couple has children early on, they will be grown up earlier, giving their parents more independence. Men will be less affected when they come into their infamous mid-life crisis and decide to abandon their first family. For women, if at age 30 the children are already beyond infancy, they may still invest more into their working career as opposed to this happening at age 40. Of course, there are many pluses and minuses to be considered in both directions, but at least we want to start an interesting discussion about the timing of fertility that has implications beyond the individual life cycle.

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