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A first assessment report of what could be done  
differently in the field of assumption making on the  
basis of insights from cognitive science, group  
dynamics and decision analysis

Work Package 3  
Uncertainty, expert knowledge

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# **A first assessment report of what could be done differently in the field of assumption making on the basis of insights from cognitive science, group dynamics and decision analysis**

After evaluating the empirical assessment of the current practice of assumption making at the statistical offices of EU member countries, we began to think about new ways in which expert arguments could be used to improve the process of demographic assumption making for population forecasting.

As became empirically apparent in the survey of statistical agencies and had already been anticipated in the writing of the MicMac proposal, a major weakness of the usual process of defining assumptions is the lack of consistent and comprehensive evaluation of alternative scientific arguments that would suggest different future pathways. In particular, there are many reasons to move away from purely expert-based assumptions to argument-based assumption making. The reason lies in the ample evidence that experts tend to have all kinds of personal biases and therefore, expert opinion should not be taken simply at face value, even if they are very prominent experts. Instead, the experts must present substantive arguments that support their views. These arguments can then be evaluated in a scientific discourse which makes the argument independent from the personalities of the experts who put them forward.

In order to make some headway in this direction, it was decided to initially limit the analysis to assumptions concerning the future of fertility in Europe. In this respect the two pieces work listed below were recently completed:

1. An extensive summary of old and new substantive arguments that have been published in the literature and that either support the assumption of a continued downward pressure on the level of fertility, or alternatively suggest a recovery of fertility levels in the future. The identification of such arguments is the basis for any further developments in argument-based assumption making.
2. Based on this list, a critical cognitive science perspective was taken to decompose the nature of the arguments and identify fallacies and shortcomings, including circular reasoning, confusing differentials with causes and overemphasizing specific aspects. This critical view of the listed arguments concludes with the proposal of a list of five major independent forces that can be influential in shaping the fertility level of the future: ideal family size, changing patterns of education and work, macro-level environment, stability of partnerships and bio-medical conditions. We will study how these five forces influence fertility in the life cycle. Specific arguments will then have to address the individual forces at specific points in the life cycle.

According to the work plan, the next steps will be to a) have in-depth interviews with selected experts in the field of forecasting to further operationalize the new structure of designing the argument basis for assumptions, b) expand the structure to also include mortality and migration, and c) fully test it for one EU country before month 24.

# **Will the birth rate in Europe recover or continue to decline?**

## **A summary of published arguments in support of alternative future fertility trends**

*Wolfgang Lutz*

A review of current population forecasting practices in Europe shows that there is a need for a better argumentative basis for making assumptions on all three components of population (fertility, mortality and migration). As a first step in the efforts of the MicMac project to make some progress toward a future argument-based process for defining such assumptions, this paper tries to summarize the main arguments that have been put forward in the literature over the past decades in order to argue for forces that will either exert upward or downward pressure on the level of fertility in Europe. Although every attempt to produce such a summary includes some subjective choices, we will try to discuss some of the most influential arguments that have been published in the scientific literature. We can see six arguments that suggest higher future fertility and eight indicating continued fertility decline. While some of the arguments tend to be rather narrow in their scope, others are very broad and therefore sometimes overlap with other arguments.

The following list of arguments is presented as a first step toward moving in the direction of a more systematic consideration of alternative arguments in the production of fertility projections in Europe.

### **The Lack of a Theory with Predictive Power in Post-Demographic Transition Populations**

Explanations and projections of fertility trends in different parts of the world have been generally guided by the paradigm of demographic transition which assumes that after an initial decline in death rates, birth rates – after a certain lag – also start to fall. In this general form, the model has received overwhelming empirical support in capturing the remarkable fertility changes that happened during the twentieth century.

The demographic transition began in the late eighteenth and nineteenth centuries in today's more-developed countries (MDCs) and spread to today's less-developed countries (LDCs) in the latter half of the twentieth century (Notestein 1945; Davis 1954; Davis 1991; Coale 1973). The conventional "theory" of demographic transition predicts that as living standards rise and health conditions improve, mortality rates first decline and then, somewhat later, so too do fertility rates. Demographic transition "theory" has evolved as a generalization of the typical sequence of events in what are now MDCs, where mortality rates declined comparatively gradually from the late 1700s and then more rapidly in the late 1800s and where, after a gap of up to 100 years, fertility rates also declined. Different societies experienced transition in different ways, and today various regions of the world are following distinctive paths (Tabah 1989). Nonetheless, the broad result was, and is, a gradual transition from a small, slow-growing population with high mortality and high fertility to a large, slow-growing or even slowly shrinking population with low mortality and low fertility rates. During the transition itself, population growth accelerates because the decline in death rates precedes the decline in birth rates.

Unfortunately, the demographic transition paradigm – although useful for explaining global demographic trends during the twentieth century and having strong predictive power in terms of projecting future trends in countries that still have high fertility – essentially has nothing to say about the future of fertility in Europe (Lutz 1994). The recently popular notion of a “second demographic transition” is a plausible way of describing a bundle of behavioral and normative changes that took place recently in Europe, but it has little or no predictive power. In fact, the social sciences as a whole have yet to come up with a useful theory to predict the future fertility level of post-demographic transition societies. Forecasters can only try to define a likely range of uncertainty. As the fertility transition is irreversible, we are sure that the fertility rate will not go back to pre-transitional high levels, say, to above a value of 3.0. There is no equally convincing argument about a lower bound, although many demographers tend to think that fertility is unlikely to fall below 1.0 for long periods. But where fertility will come to stay within such a range is very uncertain, and there is a real possibility that future fertility will show the strong fluctuations we have seen over the past decades. Hence, thinking in terms of a long-term stable level – as underlies the population projections of the United Nations and of many statistical agencies – may be the wrong way of thinking about the future.

## **Arguments in Support of Assuming Higher Fertility**

### ***(a) The homeostasis argument***

The usual interpretation of the demographic transition theory is that an initial equilibrium between high birth rates and high death rates is disturbed by declining mortality which, in due course, triggers a fertility decline that will bring birth and death rates back into equilibrium at low levels. However, history has shown that fertility declines with all their irregularities and national particularities have not generally stopped at replacement level but have continued to decline further. The homeostasis argument would stress that this is simply an overshooting that will be reversed after some inevitable societal adjustments. Recently, this has been most explicitly expressed by Vishnevsky (1991) who does not see fertility levels as the sum of individual behavior but rather as one aspect in the evolution of a system that determines behavior. He believes that the development of the demographic system is directed by a proper, inherent goal. In the process of self-organization the system aims at self-maintenance and survival. For human beings at a certain stage of evolution, a new and higher goal is assumed to appear that goes beyond pure population survival, namely, one of maintaining homeostasis in the reproduction of the population, even in the face of considerable fluctuations in external conditions (see Vishnevsky 1991, p. 265).

It is difficult to test this hypothesis empirically because it does not specify the time horizon within which fertility rates would recover. In Lutz (1994) it was mentioned that the then recent fertility increase in Sweden, a forerunner of many other social issues, might possibly be seen as an example of such a homeostatic response. But since the early 1990s, fertility has declined in Sweden from 2.1 to 1.5. Another weakness of this argument is that nothing is said about the mechanisms and motivations at the individual level that should induce couples to have more children. It therefore remains a philosophical argument without predictive power. At that level, the homeostasis argument still seems a worthwhile consideration, although it is highly controversial and authors such as Westoff (1991) criticize the assumption of a “magnetic force” toward replacement.

### ***(b) Assumption of fertility cycles***

Several views summarized under this heading have in common that they believe the present low level of period fertility to be just the bottom of a cycle and that the future will bring an upward trend. These views can be grouped into arguments with respect to the timing of fertility within cohorts and to intergenerational fertility fluctuations. The first argument was based on the observation that in many countries the recent declines in total fertility were accompanied by declines in the fertility rates of younger women. Hence, one could assume that the observed trends reflect only a delay in childbearing (the timing of fertility) and do not indicate a decline in the number of children a woman has over her life span (the quantum of fertility). As there has been much new writing on the tempo effect in recent years, this issue will be treated as a separate argument listed below as (e).

The other view of cycles focuses on intergenerational effects. Here, it is assumed that the fertility level of the parent generation is a determinant of their children's reproductive behavior. Best known in this context is Easterlin's relative income hypothesis (Easterlin 1980). In short, this hypothesis assumes that fertility is determined by income relative to aspirations, with cohort size determining income: generation 1 has low relative income and low fertility; generation 2 grows up with low aspirations for wealth but finds advantage in labor market conditions because there are few competitors and hence has a high relative income and high fertility; generation 3 is numerous and has high aspirations and this results in low relative income and low fertility. Empirically, this model fits nicely to the United States baby boom in the 1960s and the subsequent fertility decline. But it is only half a cycle. A new baby boom has, thus far, failed to materialize. For other countries even the historical application fits less well. There are a number of conceptual problems, such as the fact that within a generation, fertility is unevenly distributed among families – some have many children, others only one (see discussion in Lutz 1989) – and the fact that women have children at different ages, which soon smoothes out any cycle. But even if this assumed mechanism is not a dominating factor for fertility trends, it may well play a role as one among several factors, with the other factors simply being more dominant for the time being.

### ***(c) Fertility-enhancing public policies***

The discussion about possible government policies that aim to increase the fertility level is as old as the discussion of the perceived negative influences of such policies. In short, both the political feasibility and the effectiveness of such policies are unclear at this stage. Any assessment is complicated by the fact that many social policies, ranging from labor laws to pension systems, have implications for childbearing behavior, even if they are not explicitly pro- or anti-natalist. In its 2000 assessment of the state of our knowledge about future demographic trends, the United States National Research Council (2000, p. 107) gives a succinct summary:

In various ways, industrial societies already provide various rewards, but using them to deliberately manipulate fertility is a sensitive issue, potentially involving substantial economic transfers, and likely to be contested. Whether such policies will be adopted in specific countries depends on the indeterminate outcome of political struggles that are difficult even to visualize at this time. Even if such policies were adopted, the fertility response would not be predictable.

There is little to be added to this summary statement except, perhaps, that over the past few years the public debate has become more heated. With the retirement of the baby boom generation (born in the early 1960s) finally appearing on the radar screen of social security and pension planners with their 25 to 30 year time horizon, the discussion has now gone well

beyond the population-forecasting community. Economic policy groups at the highest level have started to give the “demographic challenge” top priority. A study by the European Banking Federation (2004), in which the chief economists of over 4,500 commercial banks in Europe highlighted the economic dangers of population aging, stated as the first of its three main recommendations: “Increasing the birth rate is particularly important.” It is safe to expect this discussion to intensify over the coming years.

As for the “tool box” of policy measures that could influence fertility rates, there has recently been a new contribution in the proposal of “tempo policies,” that is, policies that aim not at the number of children women have in the course of their life but rather at the timing of the births. Lutz and Skirbekk (2004) have recently proposed that such tempo policies could be operationalized by reforming the education system to shorten the period of education – which typically precedes childbearing – and thus exert downward pressure on the mean age of childbearing while still enabling the same level of education. Such reforms are already under way in many countries for reasons unrelated to demography and, hence, could also be given a demographic rationale.

#### ***(d) National identity and ethnic rivalry***

While macroeconomic concerns, such as the pension gap, cannot be expected to influence individual reproductive behavior without public policy intervention, this may not be the case with the issue of national identity. Fears related to the ethnic composition of the population and ingroup-outgroup feelings can be powerful emotional forces that may directly influence individual reproductive behavior.

In Lutz (1994), examples of this were found in Israel/Palestine, Northern Ireland, and the Baltic states where clear rivalry between two population groups seemed to be associated with higher fertility levels than might have been expected both from their socioeconomic standing and when compared with other populations. One could hypothesize that such fertility-enhancing ethnic rivalry could be spread to other industrialized countries as migration establishes new ethnic minorities. But the empirical trends of the past decade have not confirmed this hypothesis. On the contrary, there are strong counterexamples, such as francophone Canadians, non-Hispanic Californians, or Germans living in cities with a large Turkish population, all of whom have very low fertility and where evident ethnolinguistic rivalry is expressed by means other than fertility levels. Furthermore, the most recent demographic trends from the Baltic states show that the fertility rates of both ethnic groups – Russians and nationals – have fallen significantly. Hence, it looks unlikely that ethnic rivalry will become a significant fertility-enhancing force in Europe in the coming decades.

#### ***(e) An end to the tempo effect***

Although demographers have long known that period fertility rates, such as the most-often-used “total fertility rate” (TFR), are distorted by tempo effects, it is only in recent years that more systematic attention has been paid to this phenomenon and that tempo-adjusted fertility rates have been proposed. The tempo effect refers to the fact that period fertility rates are artificially depressed at times when the mean childbearing age increases. It was estimated that, at the EU15 level, the measured fertility rate of around 1.5 children per woman would, in fact, be more like 1.8 if the increase in the mean childbearing age suddenly stopped (Lutz et al. 2003). The close relationship between low period fertility and increasing mean childbearing age can also be clearly seen from trend data for the new member countries of central and eastern Europe. Figure 1 shows that after decades of relative stability, the TFR began to decline steeply around 1990 at the beginning of the major political and economic transformations in those countries. Figure 2 shows that this decline was associated with an

equally sudden increase in the mean childbearing age. In other words, women in these countries had started to postpone childbearing. But even if they all postpone having children (and completed cohort fertility does not change), period fertility, which is currently depressed, will have significant and lasting effects on the absolute numbers of children born and will therefore represent a force toward population decline and accelerated population aging.

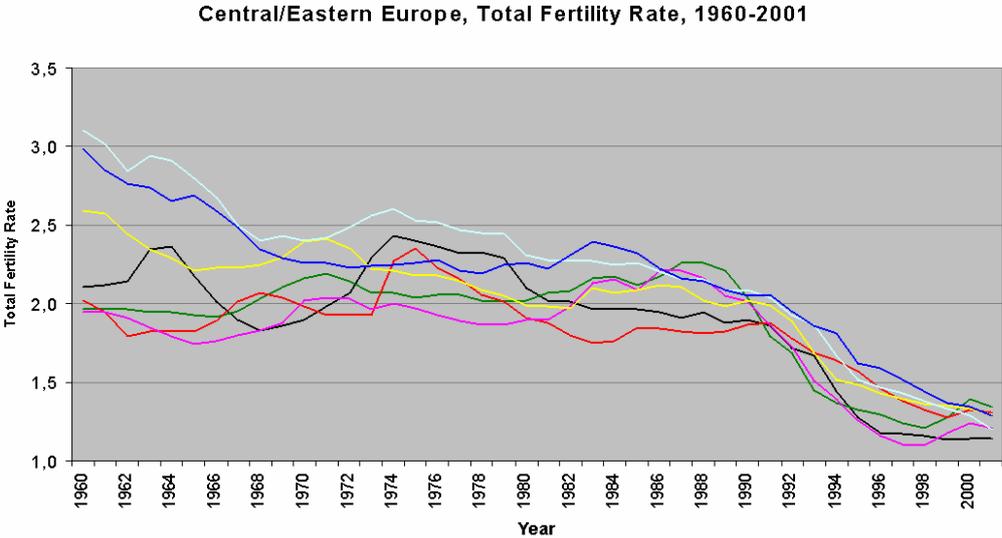


Figure 1. Central and eastern Europe, total fertility rate, 1960-2001.

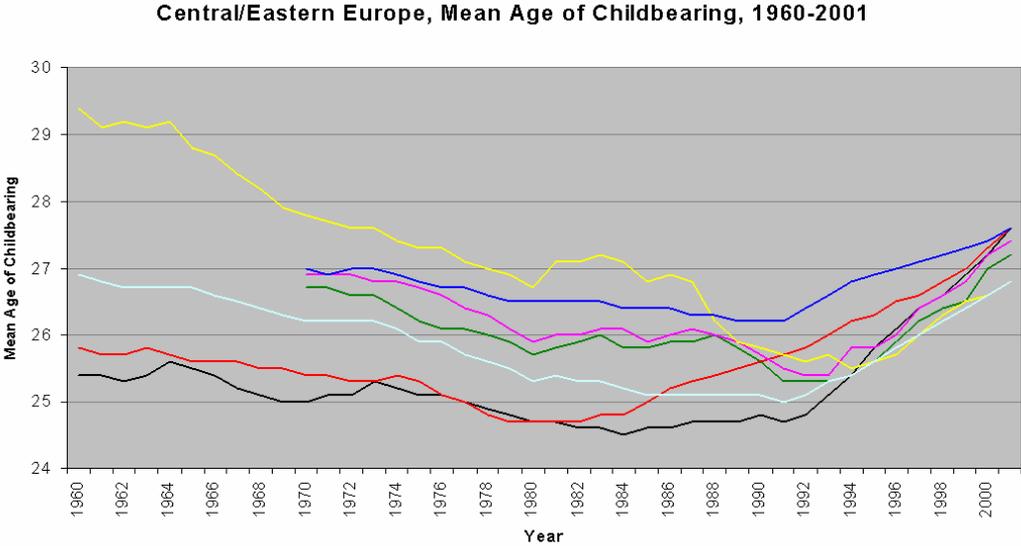


Figure 2. Central and eastern Europe, mean age of childbearing, 1960-2001.

This so-called tempo effect on fertility has recently received considerable 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. First, women are postponing giving birth, resulting in fewer births in the calendar years during which this delay happens (the tempo effect). Second, even after adjusting for this tempo effect, fertility is below replacement level (the so-called quantum of fertility). If

women do not completely forego giving birth, delayed childbearing does not affect the total number of births women will have over the course of their lives (the cohort fertility), but it still lowers period birth rates as long as postponement continues. Figure 3 illustrates this somewhat counterintuitive phenomenon graphically. Let the blue line be the mean age of childbearing which is constant until year 4, then increases by 0.2 years (roughly the annual increase currently experienced in Europe) over the fifth year, and stays constant thereafter; the period fertility rate will then be lower in the fifth year (here 1.4 instead of 1.8) because some women who would otherwise have had their children in the fifth year waited until the sixth year. And in the sixth year the period fertility will be back to its old level if the mean age at childbearing is again constant at the higher level. It is important to note that this process will not, by itself, result in a compensatory higher period fertility rate in the later years unless the mean age falls again (as indicated by the dotted lines in year 10) and unless there is an inflated period fertility during this year.

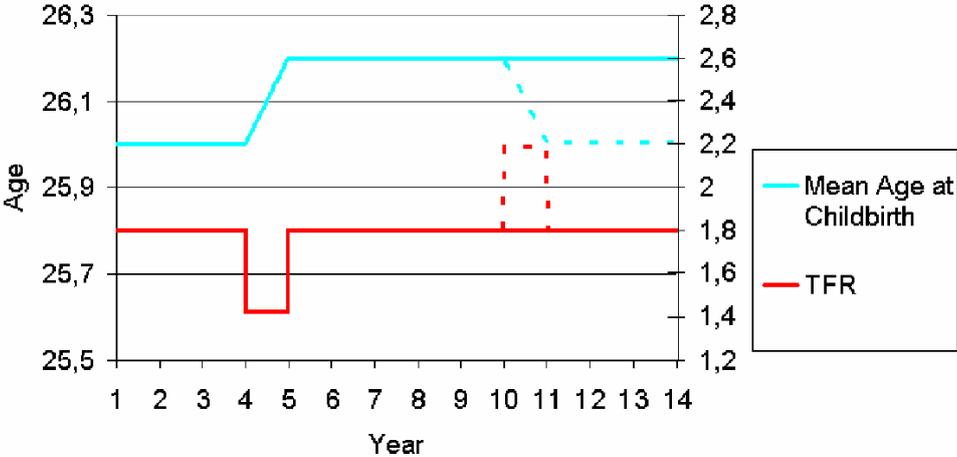


Figure 3. Illustration of the tempo effect in which an increase in the mean age of childbearing (blue line) in year 4 results in a depressed period TFR in that year.

In the context of tempo analysis, much of the demographic work to date has focused on estimating fertility rates that adjust for this tempo effect, seeing it as a disturbance that should be eliminated to enable a “purer” fertility measure to be produced, namely, the tempo-adjusted total fertility rate. Lutz et al. (2003) turn this approach upside down and focus on the tempo effect, not as a problem to be ironed out but rather as a focus of interest that could provide a leverage point for possible attempts to influence the level of period birth rates, something we call “tempo policies.” Quantitatively, these show that at the EU15 level, a hypothetical end to postponement would bring the period TFR up from currently 1.5 to 1.8, a development that over the coming decades would significantly moderate population decline and aging. Their scenarios also show that about 45 percent of the calculated population decline is due to the tempo effect. In terms of aging, they show that a continuation of the tempo effect for the next 10-40 years would imply the need for an additional 500 to 1,500 million person-years of workers to support the elderly population for the rest of the century, as compared to 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 in population dynamics in Europe and one that requires special attention.

In real life some of the postponed births will never take place; moreover, increases in the mean childbearing age tend to reduce the quantum of the fertility of the cohorts concerned.

This can arise for various reasons, ranging from instability of partnerships to involvement in the work force, but it is particularly due to declining fecundability (the probability of becoming pregnant) with age, a decline that accelerates for women after age 35. This “tempo-quantum interaction” is an additional important factor when studying the consequences of postponement on fertility rates.

Will the fertility-depressing effect of delays in childbearing continue in the future? Some countries where the mean childbearing age is already around 30 years, for example, France, the Netherlands, and Spain, have recently seen a leveling off of the increase. But in many countries, particularly those of central Europe, the mean age of women giving birth is still much lower. If we assume some sort of social convergence in Europe, this would imply that some of these countries may well experience many more years of increasing age at childbearing and hence, a fertility-depressing tempo effect. And there are currently very strong social and economic forces in our society that exert pressure toward later childbearing. A few worth mentioning are the expansion of education, high youth unemployment, and an increasingly competitive work situation for young people who do find a job.

But there is no doubt that at some point, postponement will have to come to an end and at that point in time, period fertility rates would again increase to the level suggested by the “tempo-adjusted” fertility rate (1.8 instead of 1.4 in the above example), always assuming that the quantum of fertility did not decline further. Hence, several authors expect that over the coming years, period fertility rates will recover somewhat, particularly in those countries where the mean childbearing age is already rather high.

#### ***(f) Rock-bottom fertility***

Finally, in the recent literature some authors have suggested that the fertility level we are seeing in today’s countries of lowest fertility is probably the lowest we will ever see. This assumes that there is some minimal (rock-bottom) fertility level below which fertility rates will not fall (at least, not for long periods). Authors have made these assumptions for differing reasons. Sobotka (2004) has shown, based on tempo-effect reasoning, that in none of the countries with recent period fertility rates below 1.3 (lowest-low fertility) have the tempo-adjusted fertility rates fallen below that level. He thus concludes that at least in the near-term future, 1.3 seems to be a bottom level of fertility that is unlikely to be breached.

More substantive reasoning comes from the recent work of Foster (2000), who argues that there is a genetic predisposition toward nurturing behaviors that will always lead men and women to have children. She finds three intertwining groups of concepts in the motivation for parenthood that are clustered around the ideas of love, passing on genes, and finding some meaning in life, in particular, (a) the desire to love and nurture a child and to create a family, (b) the desire to have a stake in the future, to pass on one’s own genes and those of one’s partner, and to “live on” in someone else, and (c) the desire to find a meaning and purpose in life beyond attaining individual educational, economic, and career aims. If true, these arguments make it unlikely that human fertility will approach zero, although this kind of qualitative research cannot predict the level at which it will stop falling.

In a similar vein, Antonio Golini (1998) has speculated what might be the lowest possible level of cohort fertility. Simulating a case in which 20-30 percent of all women remain childless and the remainder have just one child, he comes up with the estimate of 0.7 to 0.8 children per woman as the lower bound for cohort fertility. But what guarantees are there that childlessness will not increase to above 30 percent? In western Germany it is already estimated to be above 40 percent for women with an academic education. In other words, it is very difficult to make the case for any specific level of fertility (other than zero) as

a lower bound. And, as it turns out, some of these estimates are still substantially lower than those currently being experienced in the countries of lowest fertility.

## **Arguments in Support of Assuming Lower Fertility**

### **(a) Trend toward individualism**

According to the sociological theories of Durkheim (1902) and Tönnies (1887), the process of “modernization” is characterized by a transition from “community” (*Gemeinschaft*) to “society” (*Gesellschaft*). While “community” refers to a lasting and complete living together under a relatively stable structure, “society” means a mere proximity of persons who are independent of one another and is characterized by relatively open structures. In the process of transition, an increasing number of functions that used to be met by the family have now been taken over by anonymous institutions. This means not only an increase in equality and personal freedom but also in individualism, as well as a weakening of interpersonal bonds. Regarding the future of the family, Hoffmann-Nowotny (1987) assumes that the trend of increasing differentiation as well as multiple and partial integration will continue, especially for women. From a sociological point of view, he concludes that there is little reason to believe that the family as we know it can and will survive as the mainstream model for future living patterns. This view is not too different from the notion of a “second demographic transition” put forward by Lestaege (1983) and Van de Kaa (1987) to characterize a new phase of demographic behavior that expresses itself through a lower propensity for marriage, a higher instability of unions, increase in non-marital fertility, and lower total fertility.

Another psychological aspect of this supposed trend toward individualism is that men and women are increasingly reluctant to make decisions that have long-term consequences and that clearly limit their future freedom of choice. And the decision to have a child predetermines many choices for the subsequent two decades; once a child is born, second thoughts are impossible. If the trend toward greater mobility in all aspects of life were to continue, this could well mean fewer responsible men and women daring to become parents.

While there is little empirical basis for evaluating the validity of the presumptions for the future described above, they do seem to be powerful arguments and plausible explanations for recent trends. If, in the future, this trend goes to an extreme, counterforces could be mobilized to compensate for some of the negative aspects of this. But a return to traditional patterns of “community” with their restrictions on individual freedom is very unlikely. Most of the following arguments are more or less related to this general “continued modernization” argument, but they should be mentioned because they emphasize specific relevant aspects.

### **(b) Economic independence of women**

One recent trend, often singled out as a dominant feature of societal change, is the increasing economic independence of women. Female participation in the labor force has been increasing steeply in virtually all industrialized countries over the last decades. The increase has been strongest in Scandinavia, where labor force participation is almost universal among adult women below the age of 50. Female activity rates in North America are not much lower; and in Italy over the last decades, female participation in the labor force increased by more than one-third. One might expect such a fundamental change in the role and orientation of women with respect to economic activity to be associated with changing reproductive patterns, unless work and childrearing are fully compatible.

One must be cautious, however, in pointing to female economic activity as a major determinant of declining fertility. It may also be that the lower number of children desired by

women motivates them to enter the labor force rather than stay at home or there may be a joint driving force behind both trends. This is supported by the evidence that in several countries, fertility rates have recently recovered, despite very high and still-increasing female participation in the labor force. The key question in this multifaceted issue seems to be how women can combine parenthood with participation in the labor market (see, e.g., Kiernan 1991). This may be a decisive question for future European birth rates. While even with flexible legal regulations and good child care systems, career-oriented women on average will not have very large families, for more family-oriented women, policies aimed at improving compatibility may make a difference.

More recent studies have pointed to the changing nature of the correlation between female employment and fertility across European countries. Engelhardt and Prskawetz (2004) have shown that around 1985 this correlation changed from significantly negative to significantly positive, in other words, that higher female employment has, over the past two decades, has been associated with higher fertility in Europe. This seems to be mostly a function of the dichotomy between high fertility countries that also have high female participation in the labor force (most strongly in Scandinavia and France) and the southern countries with low female employment and low fertility. In the latter countries, because of the conservative social norms and the associated compatibility problems, women still have to make a fundamental choice between pursuing a career or having a family. An increasing number of young women choose the former, thus bringing down the fertility rates. In the Nordic countries and France, women are more easily able to combine both.

### ***(c) Instability of partnership***

As mentioned above, marital stability has been declining almost universally in all industrialized countries. Part of the reason for this phenomenon clearly lies in the increasing economic independence of women, as discussed above. Women are no longer forced for economic reasons to stay in an unsatisfactory union if they earn an independent income. Another reason may lie in the general increase in mobility in modern industrialized societies and in a declining threshold in the level of dissatisfaction necessary to attempt to change conditions. Whatever the social and psychological reasons may be, a young couple today can count less on actually staying together for at least 20 years, the minimum time required for two parents to raise a child.

There is increasing evidence from empirical studies (Kiernan 1992) that it is actually more harmful to children for their parents to separate than was assumed in the past, with adverse effects not only on social behavior indicators and intellectual performance but also on a child's happiness and feelings of security. Thus, responsible prospective parents, sensitive to the likely trauma of parental separation on children, may, if they have doubts about the stability of their partnership, decide not to have children. This is true of marriages and even more so of the increasing number of non-marital unions, which, as indicated by statistical data, for example, in Sweden (Prinz 1995), seem to have much lower stability.

One possible counterargument would be that remarriage (or the formation of a new, non-marital union) may actually be an incentive to have an additional child to strengthen the relationship between the new partners. Although this may happen in individual cases, empirical analysis on data for Finland cross-classified by marital status and number of children (see Lutz 1993) show that although a slight effect of this kind exists, it is clearly not significant for total fertility.

#### ***(d) Consumerism and use of time***

Commentators on the recent fertility decline often mention the increase in consumerism as a basic underlying cause. Under this form of materialism, people would supposedly prefer to invest in their own pleasures than in children; they would rather buy a new car than have another child; they would rather spend their time watching television than changing diapers. Underlying this view is the notion that having children is work and not fun. As pointed out by Keyfitz (1991), though couples in the past had to work harder and for longer hours to earn a living, they still found time to have plenty of children. The extra leisure time they have now, however, is not being spent having children. If one defines having children as work, one must talk about the opportunity cost involved. In the words of Keyfitz (1991, p. 239): “No one complains about the opportunity cost of having sex. Thus, to talk about the opportunity cost of children indeed highlights the problem of non-childbearing.” He suggests thinking of a work-fun continuum and trying to move childbearing toward the fun end of that continuum.

Whether or not childbearing, and especially childrearing, will become a more favored leisure-time activity of men and women will depend on the trade-offs between fun and burden. Some European cities already have more dogs than children. Obviously, the work-fun balance is more favorable for pets which are less of a commitment and, in the worst-case scenario, can always be given away. This argument clearly suggests that unless the burden of having children is diminished or the reward of having children is enhanced, the balance for childbearing will continue to be negative.

#### ***(e) Improving contraceptives***

This argument is less concerned with changing values, but rather it works more at a mechanistic level. It can be demonstrated empirically that, in all industrialized societies, a significant number of children are born without being planned either for that specific time period or at all. For unplanned children, demographers often distinguish between timing failure (premature pregnancy) and quantum failure (unwanted pregnancy). Both types could be reduced by more efficient contraceptive use; for the latter this would clearly imply lower fertility; for the former the issue is theoretically immaterial. In practice, however, one can assume that a certain fraction of the births categorized as timing failures may not have come about at a later point in time because of changing living conditions, such as, for instance, disruption of a union or a more demanding job. With respect to unwanted pregnancies, Westoff et al. (1987) estimate that for a number of countries of low fertility, completely efficient contraception would bring fertility rates down by somewhat less than 10 percent and would also make a significant contribution to bringing down the number of abortions.

Presently, we are still far away from a perfect contraceptive that requires no effort to use and has no negative side effects. An increasing number of women report being tired of using the pill, yet sterilization is not appealing to all (especially in continental Europe) because of its irreversibility. A hypothetical new “perfect” contraceptive, without any side effects, that is taken only once and then needs a procedure to reverse it for the woman to become pregnant, certainly would change the picture because in numerous cases of ambivalence and risk taking this would clearly inhibit pregnancies. Going to the doctor or not going to the doctor (as is the case now) in order to have a child would make quite a difference to future fertility levels.

#### ***(f) Declining ideal family size***

Despite declining fertility rates over the past two decades, the ideal size of family desired by men and women, as collected in various surveys, showed a surprisingly consistent figure of

well above two children on average in most countries. The discrepancy between high expressed preferences and actual low fertility has given rise to a family policy rationale that would help young couples have the highest number of children they want and thus contribute to raising the fertility rate. New surveys, however, have found that the ideal family size for young people may have started to decline in some countries. The most recent data from Eurobarometer suggest that in the German-speaking parts of Europe, the stated ideal family size of younger men and women may be as low as 1.7 children per woman on average. And in many other countries, the data show that the ideal family size for men and women aged below 35 is lower than for those above 35.

Goldstein et al. (2003) discuss the consistency and the credibility of these new findings which – if they are indeed indications of a new trend – will alter the current discussion about future fertility trends in Europe. Their paper also presents and discusses a plausible hypothesis to explain such a new decline; this assumes that through social learning the younger generations adapt their ideals to what they see as the reality of the generation above them, thus explaining the possible 20 to 30 year lag between the decline in period fertility and the decline in ideal family size. If substantiated, this hypothesis could point to a spiral of further fertility declines in Europe.

#### ***(g) Density, pollution, and other biomedical factors***

In recent years there has been increasing collaboration between social scientists and researchers in the biological and biomedical fields concerning the possible physiological factors involved in the recent fertility decline. These studies have a broad range of possible mechanisms and cannot be adequately summarized here. There has been rather strong evidence that human fertility declines with higher population density (Lutz and Qiang 2002) which, in a future of higher population density, would imply pressure toward lower fertility. Other studies stress the possible impacts of environmental pollution on declining sperm counts and sperm quality which in some countries seem to have reached alarmingly low levels (Skakkebaek et al. 2001). There are arguments that smoking, stress, and different kinds of pollution are already resulting in a higher degree of involuntary childlessness, particularly in cases where births have been postponed until an age at which biological fecundability is already starting to decline.

There does not seem to be any convincing evidence yet that pollution is indeed a factor driving the fertility decline, but the possibility cannot be dismissed when the future of fertility is being considered.

#### ***(h) Competitiveness associated with globalization***

One final argument has to do with economic globalization and the associated increase in competitiveness at all levels. To be successful in a globalized economy, a young man or woman has to invest money in education, be very mobile (ready to move to different places at short notice), and be prepared to work late evenings and at weekends, if necessary. These last two conditions do not make it easy to maintain a stable relationship or to raise young children. Hence, modern economic conditions are sometimes characterized as being structurally unfriendly toward establishing a family. If they do not inhibit fertility completely, such conditions are at least a strong incentive to postpone childbearing and thus contribute to the tempo effect as well as to the risk of not being able to have children once working conditions are considered sufficiently established for a baby break to be affordable. As these forces of increasing competitiveness are likely to become even stronger in a further-globalizing world, they may become a powerful driver toward even lower fertility in the future. In fact, although

the emphasis on globalization is novel, the idea that competition leads to low fertility goes back over 100 years to Dumont's notion of social capillarity.

## Conclusions

This attempt to summarize some of the most important arguments that have either been around for a while or have been recently added to the discussions has deliberately abstained from weighing the positive and negative arguments against each other. That there are six arguments on one side and eight on the other does not necessarily mean that fertility is more likely to decline further than to recover. Weighing these factors clearly requires further analysis and must necessarily include a good deal of expert judgment. Yet, as outlined in Lutz (1996), such judgment should not be based on the opinions of experts, who do not justify their views, but rather on a scientific assessment of the validity and the relative importance of different arguments, which then can lead to some ranking.

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# **Fallacies and facts in demographic argumentation**

## **Comments on the arguments concerning the future of fertility trends from a cognitive science perspective**

*Pertti Saariluoma and Wolfgang Lutz*

### **Abstract**

By means of foundational analysis, we investigate a number of demographic arguments (with reference to the background paper by W. Lutz which gives a summary of the arguments). Our goal was to eliminate the incorrect or risky ways of argumentation concerning demographic phenomena. We present a group of solidly built, factual arguments to develop the notion of argument-based population forecasting. We outline a new type of ideal for forecasting as a diagnostic activity instead of seeing it as abstract modeling. We argue that the goal of forecasting is to analyze the real world phenomena and their laws instead of being satisfied with the external mathematical description. This stance may be called substance-based forecasting.

### **Introduction**

Population forecasting has recently gained much prominence in the context of studying likely consequences of future population ageing in Europe. At the national and European levels, numerous studies are being prepared and discussed at the highest levels. José Manuel Barroso, President of the European Commission, has frequently called demographic trends one of the three key challenges of Europe, with globalization and technological change being the other two.

Given this prominence and importance of the assessment of likely future demographic trends in Europe it is surprising to see how little systematic scientific attention has been given so far to the evaluation of arguments underlying the assumptions of future fertility, mortality and migration trends. Non-demographers would have expected that this is one of the main topics at international population meetings and that governments and intergovernmental bodies which greatly rely on these population projections in their policy formulations would commission major studies to make sure that they get the best possible information about likely future demographic trends. In contrast, the reality shows that at scientific meetings in the field of demography as well as in government-sponsored activities around Europe, the discussion of assumptions used in projections is largely absent or at best a marginal topic.

To make some progress in this direction, in this paper a demographer and a cognitive scientist join forces to critically discuss the substantive content of current population arguments used to derive assumptions about future fertility trends and point the way toward some better strategies for the involvement of expert arguments in the production of population projections in the future.

In this paper we will restrict the discussion to the question of the future trend in fertility and start with a discussion of the various arguments listed in a recent summary by Wolfgang Lutz entitled “Will the Birth Rate in Europe Recover or Continue to Decline? Summary of published arguments in support of alternative future fertility trends.”

## **Intuition and the Cognitive Science Approach**

One important contribution that metascience can make to any scientific approach is to investigate the problems in the way arguments are built in that science. Such work can help scientists find a more analytical way of thinking in their own fields. One may ask why it is important to critically inspect the argumentative basis of a science. The logic of the answer is very straightforward: All scientific argumentation ends somewhere and from that point on, the area of intuitive assumptions begins. Infinite chains of arguments are impossible, but we need to have information which goes beyond the ultimate borders of argued knowledge. This phenomenon has been familiar to most scientists ever since Euclid's elements, but we have only recently begun to consider its significance.

Intuitions in the foundations of scientific ways of thinking are unavoidable. We cannot go around them; we have to learn how to live with them. The first step in this direction is to understand them in the right manner. The problem with intuitive foundations of science is not that all our intuitions would immediately and necessarily be false, but that we do not know whether they are true and to which degree they are true. This means that we have to adopt a dynamic stance towards them. We have to turn our attention to them and consider carefully the possible strengths and weaknesses in them. When we understand the intuitive foundations better, we are also able to use this new understanding for the advancement of science. We can open new perspectives to knowledge and justify the search for new types of knowledge. Indeed, the ultimate goal of such foundational work is to deepen our understanding of what we are doing. This is a way to speed up the progress in science.

In this paper, we will conduct a critical analysis of some of the most common types of arguments used explicitly or implicitly in population projections. The goal is not to prove such arguments incorrect or empty in content, but rather to investigate what kind of knowledge can effectively add to our understanding of the phenomena underlying the discussion about future demographic trends.

## **Arguments and their Roots**

The main motivation for the analysis of arguments is to avoid inferential risk. We are often inclined to think that our scientific knowledge is more secure than lay information or pseudoscience. However, it is more secure only because we have built in important self-corrective means into our scientific system. One of them is the analysis of arguments, which allows us to pick risky details from the web of scientific knowledge.

In this study, we discuss selected arguments about the future of fertility using the classical theory of argumentation (Ermeeren et al. 1996). This allows us to form a base for critical discussion about the forms of arguments and their possible risky properties. Following the main findings of the argumentation theory, we have organized some of the most important demographic arguments concerning fertility. Fertility trends are a particularly appropriate domain to this kind of exercise, because they have a very complex network of connections to the real world. Thus, it is possible to consider very different types of explanatory phenomena when building arguments.

Before we move to the actual analysis, it is good to remind ourselves of one important conceptual difference, because we have to refer to it quite often. Explanans, i.e., explanatory premises, refers to statements that explain the explanandum, i.e., the phenomenon which should be explained on the ground of explanans. In argumentation analysis, it is always central to consider carefully the form and explanatory power of the explanans. An argument is

fallacious if it entails a substantial risk to incorrect conclusion on the ground of its form or factual contents.

On the ground of the risks of fallacies involved to the arguments used in explaining and projecting demographic trends, we can begin with arguments which are formally risky. They may be circulatory, over-generalizing or over-simplifying, conceptually unclear; they could be arguments confusing necessary and sufficient conditions.

### ***Circulatory arguments***

A typical example of a circulatory argument can be called a “curve illusion.” In this kind of argument, one refers to the properties measured as an explanans, while in fact it is the explanandum (the phenomenon to be explained). It is common to give a name to something that shows up as a measured phenomenon and to say that this phenomenon, which is a common feature of the studies trends (curves), actually explains something.

Among the fertility arguments listed in the Lutz list, the “tempo effect argument” (1-e) and the “rock-bottom fertility argument” (1-f) are subject to this problem. The tempo effect itself is a certain feature of a trend that is observed and only refers to a decomposition of the observed level of period fertility into different constituents, but does not say anything about the likely future of the trend. It is a more detailed explanandum than the total fertility rate (TFR), but because of this does not yet become an explanans. Similarly, the assumption that there is a certain rock bottom level of fertility typically refers to the fact that so far we have not seen any lower level. Hence, it refers to the observed trend (explanandum) rather than the forces that would shape this trend and stop it from falling below a certain level. The same problem affects the currently popular notion of a “second demographic transition” (SDT). It is a name given to a bundle of observed trends and is by its very nature an explanandum (or a “curve” in the above terminology). Although SDT is sometimes referred to as a theory, it must not be mistaken as an explanans. This is also reflected in the fact that it has no predictive power (except possibly for blind trend extrapolation).

In order to avoid such circularity of taking the explanandum for the explanans, one would have to anchor the argument in the life outside the curves (the observed trends). If such an anchoring is not explicated, the argument type cannot be valid.

The circulatory problem also exists when we refer to two different measurements which may be effected by the same cause but do not influence each other. When we measure a fever in a child, we do not think that the high temperature in itself is the illness, nor that the temperature in the mouth is caused by the temperature in the armpit, even though the correlation would be substantial. Instead, we look for the illness in the body, which explains the high fever as measured at both points. We know that the body defends itself from many different types of illnesses by producing a fever and therefore, we look for further symptoms to cancel out incorrect diagnoses and to find the true explanation.

### ***Too general arguments***

Some of the arguments given in the list may well capture a part of the set of forces that, in the end, shape the fertility trend, but they are at such a general level that not much can be deducted from them in terms of the likely future trends in fertility. One good example of this is the assumed trend toward individualism and the distinction of Tönnies (1887) and Durkheim (1902) between *Gemeinschaft* and *Gesellschaft* as described in (2-a) of the Lutz list. It does not explicate any clear mechanism as to how this important sociological distinction makes its way through the different levels of human consciousness and behavior to really explain the drop in fertility that we have recently experienced.

While there seems to be little doubt that most people have a more individualistic attitude today than was the case in earlier times, and while it may be assumed that this trend continues into the future and we have reason to assume that this has significant consequences on fertility, it is still not clear toward what level of fertility this process would be heading. Will an asymptotical move to a fertility level of zero be the consequence of continued relentless individualization?

Another argument that falls into this category is the homeostasis argument, listed as (1-a). This argument essentially assumes that “something” will happen in order to bring birth and death rates back into a long-term balance. Homeostasis can happen at the level of individuals (within people) and at the level of society (among people). In general homeostatic theories point out that human beings have a natural tendency to reproduce. While this is clearly true from an ex post evolutionary perspective (the human species has survived because it reproduced), it does not necessarily imply that this determines current individual behavior driven by some “need” to reproduce. It is unclear what the homeostatic “need” would here refer to. In a psychological and biological sense, all needs, such as hunger, thirst and temperature control, work in a homeostatic manner. This means that the system moves toward a balance at the individual level. However, these systems have been similar in human biology for thousands of years and it is very difficult to understand how the newly-emerged phenomenon of low fertility would relate to such ancient behavioral patterns.

If we look at homeostasis at the strictly societal level, this would be equivalent to saying that humans have some psychological or social need to keep the number of babies born in their population within certain limits. Unfortunately, such a concept is unclear and cannot specify the mechanisms through which individuals are lead to meet social needs. To call such possible mechanisms “homeostatic” is a misleading label. It does not connect the phenomenon of fertility change to any known psychological phenomenon and overlooks the systems of family and individual decision systems and their connections to social conditions.

### ***Pointing at differentials instead of causes***

Many of the social sciences have been inspired by the observation of differentials. Individuals and their behavior differ from place to place, over time and among individuals. These differentials typically give rise to the formulation of explanations as to why the observed patterns of behavior differ. These explanations point the way to the more general causes of behavior. In many cases, however, the analysts stop short of providing real explanations for the observed differentials and suffice with just describing the differentials, though often in a rather sophisticated, multi-variate statistical setting.

Frequently, arguments made about the likely future trend in fertility focus on differentials rather than the mechanisms causing these differentials. Examples in the list of arguments include the role of national identity and ethnic rivalry argument (1-d) as well as the economic independence of women argument (2-b). In both cases it is observed that populations or sub-groups of women who live under specific environmental conditions have on average fewer or more children than their contemporary counterparts under otherwise identical conditions. Although there may be some vague implicit assumptions about what underlying causes lead to the observed differentials, these causes are usually not spelled out clearly. The same is true when people point at the fact that urban women typically have lower fertility than rural women and conclude from this that increasing urbanization will lead to lower fertility. Or with respect to education, the fact that more educated women tend to have lower fertility, combined with the fact that in the future, women will be better educated, is taken as an indication that in the future this will lead to lower fertility. While this expectation may well be correct, the argument has to be careful in not just pointing at the evident

differentials, but in trying to argue with respect to the underlying reasons. In the case of education, it probably is not the degree itself that leads to lower fertility but the associated process of staying in school/university longer, changing values as a consequence of this process, etc.

### ***Partial arguments referring to specific aspects***

There are also possible arguments that affect factors that clearly matter for reproduction in one way or the other, but it is not clear how important they will be as compared to other factors. In the given list of arguments, this is particularly the case with respect to the biomedical factors including pollution and the effects of density (2-g). While there seems to be convincing evidence that in some countries there have been significant declines in the quantity and quality of sperm counts, and a sufficient number of healthy sperm clearly are a prerequisite for natural conception, some commentators have taken this as an explanation for the declining birth rate. But this relationship is far from straightforward. As discussed in a recent special issue of the *International Journal of Andrology* (Joergensen et al. 2005), declining sperm quality and counts may well affect the waiting time to conception (and only in rare cases lead to infertility), but this interacts in a complex way with characteristics of the partner as well as the nature of the partnership.

But the problem of partial explanations is much broader than the example above. Essentially all arguments about future trends in fertility focus on certain partial aspects, while leaving others out. Hence, it will be one of the most challenging tasks for the development of a new model for argument-based assumption-making to bring these different aspects together in a comprehensive way in which the weights attached to the different factors resemble reality as closely as possible. In other words, we will have to distinguish between the validity of certain arguments concerning each factor, and the role that this factor is likely to have in shaping the future of the fertility rate.

The above-mentioned considerations, which try to critically review some of the most frequently used arguments about the future trend in fertility, illustrate clearly that more analytical rigor is needed in specifying and evaluating the arguments about the drivers of fertility change. Instead of relying on vague concepts and looking for overall correlations, we should be able to consider more exactly the way in which psychological and social mechanisms penetrate the minds of people and the decision-making process that, in the end, results in fertility. Only in this way is it possible to build more solid models of explaining what happens in the real world, and have a structured argumentation of what may happen in the future.

### **New Ways Towards Argument-Based Forecasting**

Based on the analysis presented above and on the identification of possible traps and pitfalls in the specification of arguments, we will try to present a scheme of core substantive arguments that try to avoid (as far as possible) the above problems and could be the basis of a future scheme of argumentation about the future of fertility. This first attempt will need more cycles of discussion to be in a position to build stronger and more scientifically-solid grounds for demographic argumentation, analysis, modeling and forecasting. The following structure could form the outline for a new round of in-depth interviews with selected experts as a next step.

Key arguments about the future of fertility in Europe:

A) Forces on which future fertility will depend: At the moment we can think of these five rather independent forces (the big five):

- 1) The trend in **ideal family size** and the strength of individual desires for children as compared to other joys in life.
- 2) The trend in the patterns of **education and work**, including the proportion of time to be dedicated to the professional side of life (in the context of globalization).
- 3) Changing **macro-level conditions** (government policies, child care facilities, housing, etc.) that influence the cost of children in a broader sense.
- 4) Changing the nature and stability of **partnerships**.
- 5) Changing **bio-medical conditions** (sperm quality and counts, female fecundability, new methods for assisted conception).

Questions: Are these forces mostly independent? Did we leave out other independent key forces?

B) We list arguments that would explain changes in these forces in either direction (if possible, list equal number of arguments for decline and increase). There should be 3-5 lines written on each argument influencing each of the forces. (There should be an option to add additional arguments.) In the survey we should then collect three pieces of information on each argument:

- The validity of an argument in a logical sense.
- The likely magnitude of the (downward/upward) force as compared to current fertility.
- The relative importance of this argument as compared to others listed (distribute 100 impact points over the arguments).

C) We should try to weigh the five forces in terms of their relative impact on cohort fertility and on fertility postponement. This is also the place to talk about possible interactions between forces and possible feedbacks.

D) Finally, it shall be attempted to put these forces into a life cycle context. Similar to parallel biographies in event history analysis or the MicMac micro-simulation, the factors influencing these five forces shall be evaluated as individuals pass through their life cycles.

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(The missing references will be incorporated later.)

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