Lund University
School of Economics and Management
Department of Economic History

Why Portugal is not replacing generations? A period and cohort perspective.

Lídia Patrícia Tomé

European Doctoral School of Demography
2010-2011

Home Institution: University of Évora
Sponsor: NIDI
Adviser: Maria Filomena Mendes
Maria Stanfors

Home
EDSD Adviser:

ABSTRACT

The decline of fertility in the last decades together with an increase in family policies, as well as the economic recession that recently manifested affects all European countries. With the aim of understand this impact in the European context and particularly in Portugal, this paper conduct us through a brief revision of literature and methods regarding the fertility decline. This research project addresses five central research questions: First is intended to observe the impact of tempo and quantum effect in period fertility. Second and because cohort fertility has been overlooked, the observation of fertility postponement and recuperation is important to identify the differences in fertility behaviour by period and cohort. The third research question seeks to examine if there exists a significant influence of economic crises in the actual stagnation of fertility in some particular countries, such as Portugal. The fourth question is related with the impact of family policies in fertility. The last research question is related with the projection of future behaviour of period and cohort in a context of low and not recuperating fertility.

Contents

INTRODUCTION

After World War II fertility patterns experience a severe decline. The cohorts of women born after this period reveals a shift of the age at childbearing to later ages and this situation resulted in the decline of period fertility. Since the early 1970's that postponement of childbearing has become one of the most prominent features of European fertility rates. The persistent fertility postponement has affect the most usual indicator of period fertility, the total fertility rate (TFR), that has decreased in many countries to low levels (lower than 1.3). This period of low fertility has been identified by some the authors as the period of "lowest-low fertility" (Kohler et al. 2001). This low fertility was "characterized by a rapid shift to delay childbearing, a low probability of progression after the first child and a falling behind in cohort fertility at relatively late ages particularly in Southern Europe (Kohler et al. 2006). However this was not a consensual definition and its use has been conducted in a very reluctant way especially because the authors expected that lowest-low fertility would continue to be persistent pattern in the following decades.

The fertility decline is also associated with the Second Demographic Transition, widely supported by van de Kaa (2002) who assumes that the principal characteristics of this new demographic moment/dynamic are the rising number of couple in cohabitation, the rising of fertility outside the marriage and a low total fertility rate. The junction of these characteristics and the increasing of life expectancy results in aging societies where the values for population replacement are very low. In this sense the concept of Second Demographic Transition emerges along with the development of problems associated with the effect of *tempo* and *quantum*, in particular in the analysis and prediction of period fertility.

The massive postponement and recuperation of childbearing in low-fertility societies have presented important sociological and demographic developments during the past half century (Frejka 2010). After the pronounced decline of fertility (lowest-low fertility) during the 1990s, between 2000 and 2008, fertility rose in the large majority of European countries. This trend represents an unexpected reversal from fertility levels below 1.3 in most countries during the 1990s or in some cases in early 2000s. The number of countries with a TFR below 1.3 declined from 16 in 2002 to just one in 2008 (Goldstein et al. 2009).

Research has shown that tempo and quantum effect in the developed countries of the world explain much of the actual situation of fertility. The economic situation is also presented as one of the reasons for the fluctuation of fertility levels especially when fertility is decreasing sharply. The significant decline of fertility and the increase concern of society with the population growth created an increase of family policies. My work focuses in a review of the literature and methods related with, (1) the impact of tempo and quantum in period fertility; (2) the cohort fertility that has been overlooked in the observation of fertility postponement and recuperation; (3) the observation of a "real" influence of economic crises and families policies in fertility; (4) the projection perspective of period and cohort fertility (cohort-component method).

FERTILITY CONTEXT OF SOUTHERN EUROPEAN COUNTRIES

In 2005 the fundamental argument to Kohler et al. was that the emergence of low fertility in Europe was due to a combination of four distinct behavioural and demographic factors. The first factor identified were the *economic and social changes* that made the postponement of fertility an individual and rational response. The second factor, the *social interaction processes* that effect the timing of fertility have submit the population response to these new socioeconomic circumstances substantially larger than the direct individual responses. As consequence, the socioeconomic changes can explain the rapid and persistent postponement from early to late age-patterns of fertility that is associated with the trends of low and lowest-low fertility. The third factor, the *demographic distortion of period fertility measures,* caused by the fertility postponement and changes in parity-composition of populations have "shrink" the level of period indicators below the related level of cohort fertility. Finally the fourth factor is the institutional settings which in Central, Eastern and Southern European countries have favoured an overall low fertility quantum. Moreover the institutional settings caused, due to the delay of childbearing, large reductions in the completed fertility in lowest-low fertility countries.

The income levels per capita in the South European (Spain, Italy, Greece and Portugal) countries are at the medium to high levels with stable growth, and until 2005 these countries experienced stable and low inflation. In 1989 and 1999, Spain, Italy and Greece had the highest youth unemployment rate in the European Union. Portugal (table 1) was the only Southern European country with relatively high fertility and considerable lower unemployment (Kohler et al. 2005).

Table 1: Youth unemployment rates (under 25) in Southern Europe

Country	Women 1989	Women 1999	Men 1989	Men 1999
Italy	38.5	38.3	25.9	28.6
Greece	34	39.3	17	21.4
Spain	42.6	37.3	24.4	21.7
Portugal	15.8	11.1	8.3	7.5
EU (15)	19.6	19.2	14.4	16.7

Source: Reproduced from Kohler et al.(2005):Table 4

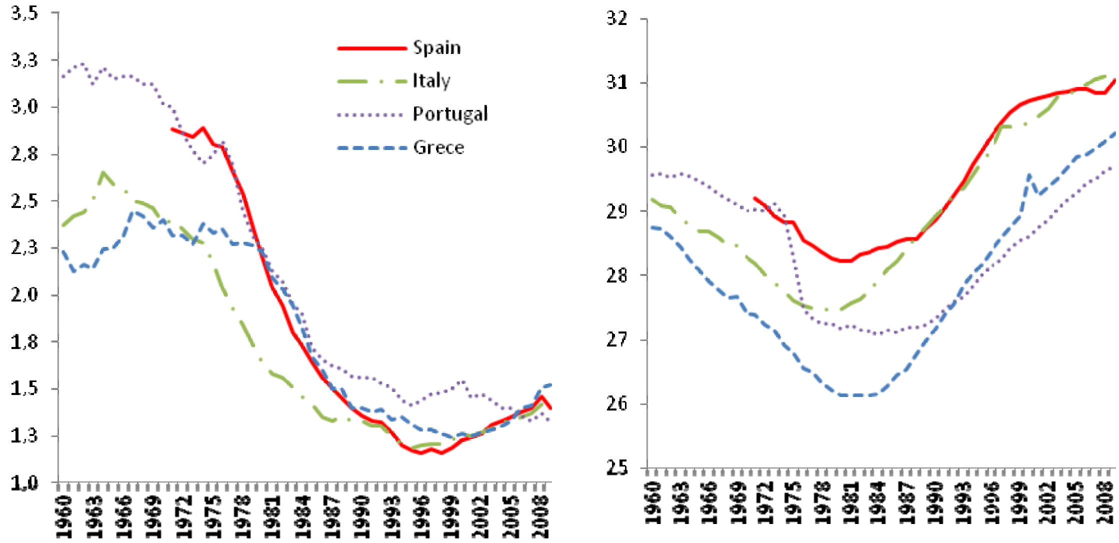
The chronic and high unemployment in the south European countries appears to have discouraged the young adults from entering in the labour market and as consequence the formation families start to decrease and the childbearing postponed. Is widespread in the literature that countries with lowest-low fertility share institutional settings characterized by positive discrimination relatively to low quantum of fertility, i.e., the Southern European countries provide highly insufficient child-care support (Esping-Adersen 1999). The labour market is relatively inflexible in terms of possibilities for part-time work or re-entering in the labour market after a period of childbearing. In comparison with Western European countries, the South have the lowest levels of state support for families with children in terms of tax allowances or direct transfers, but this lack o state support is compensate in the South by the family support. However the family support until later ages have a perverse effect because the young adults have a high integration in the family home, thereby the union formation and fertility are discourage. Countries with low compatibility between childbearing and female labour force participation, are subject to large postponement effects. These countries experience considerable decrease in completed fertility that is causally related to delay childbearing.

The low fertility rates and total fertility rate from the last decades in Europe, and particularity in Southern European countries, are an important challenge for the European economies due to its consequences, in terms of the equilibrium level, called welfare state (social security, education and health) and the sustainable growth and economic development in the long term. From all the four Southern European countries Portugal and Spain are the more similar in the recent trajectories in the political, social and economic fronts. Both countries exited from a dictatorial regime in the mid-1970 and both entered the EU in 1986, they have fragile welfare states and the social organization is characterized by relatively strong family-ties and low investment in family policies (Dominguez-Folgueras and Castro-Martin 2008).

If we observe the total fertility rate (figure 1, a) in the south european countries, is possible to see that between 1960 and 1970 Portugal was the country with the higher value, however and like the other three countries also Portugal saw the fertility levels decline. The major difference between the countries is that Portugal is the only country that reaches the values below 1.3 in the TFR. Italy is the first country with values below 1.3, in the year of 1993 the values were already 1.25 and two years after the TFR decline to 1.19 (the lower value registered). Spain decline under 1.3 in the same year (1993) as Italy, with the value of 1.27, and in 1996 the value of TFR reaches the historical value of 1.16. Greece is the last country that arrives to values under 1.3 and the minimum value registered is 1.24 in the year of 1999. In this context Portugal have a “good behaviour” since that never the TFR values dropped below 1.3, the lowest value registered was in 2009 with 1.32. Although the values of the Portuguese TFR are never below 1.3, contrarily to the other countries Portugal is not recovering the postponed births.

Figure 1: TFR and MAC on the Southern European Countries between 1960 and 2009

(a) Total Fertility Rate (b) Mean Age at childbearing



Source: Eurostat

Observing (figure 1, b) the mean age at childbearing (MAC), we detect a pattern similar to all countries. The decline of mean age at childbearing is common in the countries until middle 80's beginning of the 90's. The strong decline in the Portuguese mean age at childbearing is related with the end of the dictatorial regime, and the rapid increase of young population returned from the ex-colonies in Africa. Meanwhile the mean age starts to increase in all the countries and the difference between Portugal and the other three countries is on average 1.5 years. Although Portugal and the Southern European countries don't present significant differences among them, Portugal is still in a different situation, and is important to understand how Portugal emerges to a situation that was not lowest-low fertility but was enough to constrain substantially the population growth.

With the aim to understand how Portugal have this particular situation, and it will be the future to the Portuguese population growth, is important understand the possible causes-effects that are now influencing fertility, such as tempo and quantum effect in the period fertility and the postponement and recuperation in the cohort fertility. Nevertheless and before we proceed to the revision of the literature and methods is important a brief review of the usual measures of fertility.

MEASURES OF FERTILITY

Fertility is the one of the most complex components of demographic analysis. The fertility analysis must take into account that, as opposed to the risk of die, the risk of generate a live birth is not common to all the female population, in the sense that the mortality strikes all of the population in one moment in their live and fertility is not biological "available" to all of the population. Given the complexity of fertility, must be considered not only as a multidimensional process but also as a cumulative, " given the birth may be experienced more than once and only temporarily removes a women from the risk of giving birth" (Preston et al. 2001).

The fertility analysis should be carried out in accordance with the cohort in order to allow a complete observation of the life cycle events. There are however some problems with cohort measures both in fertility our in mortality performance. First the cohorts do not provide information during specific years or short time period, which is often what in demography we are most interested in. Second, the cohort measures can be calculated only for cohorts whose life cycle event experience is complete. Third, the calculation of cohort measures requires data for all years in which life cycle events to the cohort occur (Bongaarts and Feeney 2008). Therefore, result of the lack of completed cohorts the typical way of measuring fertility is performed by the period approaches.

Even though the total fertility rate is by far the most common indicator of period fertility, in a general way to measure the level of fertility we can distinguish four basic approaches. The first indicator is the *crude birth rate* (CBR) that relates the total number of births in a given year to the total population size. However when we relate the total number of births only with the number of women in reproductive age (between 15 and 49) the crude birth rate is known as general fertility rate. The second approach to measure the level of fertility is based on the *age-specific fertility rates* (ASFR) which relate the number of births among women in a given age group to all women in that age group. The sum of ASFR in a particular year is the *total fertility rate (TFR).*

The TFR is a hypothetical indicator, interpreted as the average number of children a woman would have if the age-specific fertility rates of a given year remained constant over her reproductive life. The third approach and the one which constitutes the most accurate indicators, is based in age and parity-specific childbearing *probabilities* and *intensities* (known as hazard rates). In the case of fertility the hazard rates reflect the probabilities of giving birth of order i are specified only for women having i-1 children, in other words, the hazard rates are the parity-progression ratios (PPR_i). The PPR_i is interpreted as a probability for a woman who has i-1 children to have another child during their reproductive life. Finally we should also mention a fourth indicator suggested by Sobotka (2004) and related with duration specially because the duration is an important variable that can influence the number of births. To Feeney (1983) "the parity progression schedules which incorporate parity progression rates and birth-interval distributions are arguably the most natural approach to the measurement of fertility".

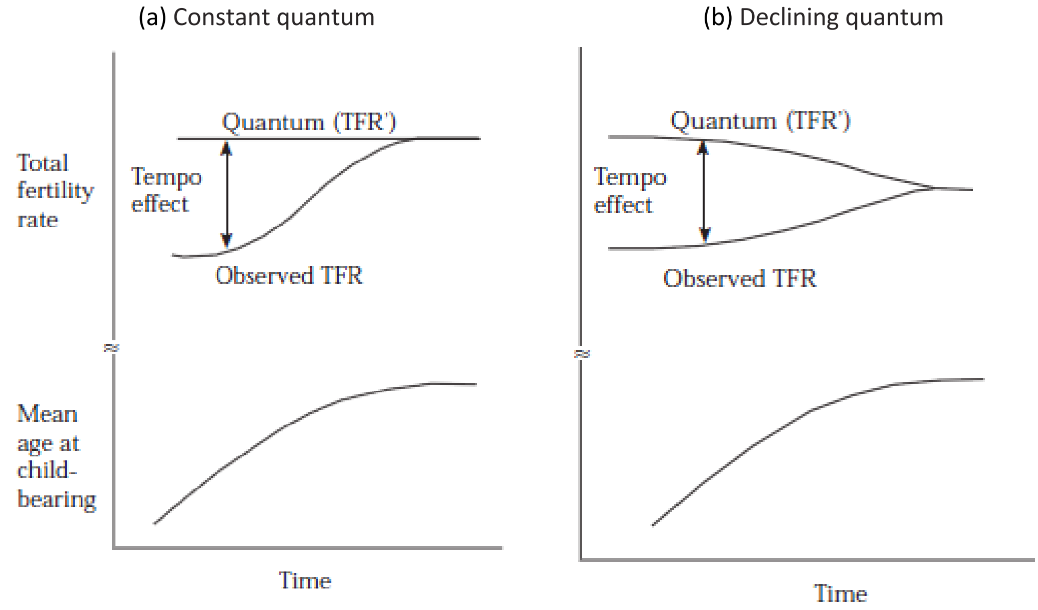
Although the TFR is not affected by changes in the age structure of the female population, the ASFR is influenced by distortion in fertility timing – the postponement or advancement of births – and the changes in the fertility schedule. The fact that cohorts – real or synthetic – are subjected to timing distortion is widely recognised among the demographers, as we will show later.

THEORY AND METHODS

TEMPO AND QUANTUM EFFECT

As mentioned above, the lack of completed cohorts results in the typical way of measuring fertility, being performed by synthetic cohorts (period cohorts). In results of these synthetic cohorts, the *period* measures were created to overcome the problems described above, still the period measures present shortcomings. In the case of fertility the most common period fertility indicators, such as total fertility rate or age-specific fertility rates, are sensitive to the "tempo" and "quantum" effect (figure 2). The terms tempo and quantum were introduced in demography by Ryder (1964) who made serious contributions to the study of quantum and tempo measures in fertility. Ryder most important finding was that a change in the timing of childbearing results in a divergence between the period total fertility rate (TFR) and the cohort completed fertility rate (CFR). With these finding Ryder proposes the translation formula between period and cohort, providing the exact relationship between cohort and period total fertility rates, as long as the age specific rates are change linearly.

Figure 2: Impact of the tempo effect in fertility



Source: Reproduced from Bongaarts (2002):Figure 8

Since Ryder in 1964 until 2011 many were the authors that expressed interest in the questions related to the timing effect in fertility among them, Bongaarts and Feeney (1998), Kohler and Philipov (2001) Zeng and Land (2002), Rodriguez (2006), to Goldstein and Cassidy (2010). To Bongaarts and Feeney (1998 and 2002), the tempo distortion reflects an inflation or deflation of an indicator of the life cycle, the resulting increase or decrease in the average age for that same event. In 1998 BF presented an adjustment to TFR, the $adjustTFR$, assuming that fertility is only influenced by age, parity, duration and period but not by the cohort. Underneath these conditions to the authors "the total fertility rate that would have been observed in a given year had there been no change in the timing of births during that year maybe estimated by" computing as a sum of order-specific total fertility rates ($adjTFR_i$) which take order-specific changes in the mean age of fertility schedule, $r_i t$ as an adjustment factor:

$$adjTFR_i(t) = \frac{TFR_i(t)}{[1 - r_i(t)]}$$

[1]

were the $r_i(t) = \frac{[MAC_i(t+1) - MAC_i(t-1)]}{2}$ and the $MAC_i(t)$ is the mean age at childbearing order i.

The $adjTFR_t$ depends on that the age schedule of fertility rates observed at any time can be transformed into the schedule observed at any other time by inflating or deflating and/or by shifting the schedule to higher or lower ages. This is equivalent to assuming that fertility is determined strictly by period effects. Although the $adjTFR_t$ could be applied to births of all orders combined, higher results are obtained by applying the formula separately to each birth order component of the *TFR*, because the constant shape assumption is more valid for the fertility schedule at each order than for all orders combined (Bongaarts and Feeney 1998). This adjustment measure present two main problems that can be summarized in two main issues, (1) the $adjTFR_t$ as well as the conventional TFR may be distorted by changes in the distribution of women by parity and (2) the period changes affect different cohorts in different ways, the tempo changes in fertility may also change the shape of the fertility schedule (Sobotka 2003).

In order to respond to this problem Sobotka (2004) suggested the use of a three-year moving average of the $adjTFR$ and compute the adjustment only for birth orders up to 3 to increase the stability in the time series of the $adjTFR$ which displays large annual fluctuations. The overall $adjTFR$ is estimated as a combination of the $adjTFR$ for birth orders 1 to 3 and the ordinary TFR for births orders 4+:

$$adjTFR(t) = adjTFR(t)_1 + adjTFR(t)_2 + adjTFR(t)_3 + adjTFR(t)_4 \qquad [2]$$

Latter in 2009 Goldstein et al. argue that by applying the Bongaarts and Feeney adjustment, we lose the last year of time series and by using a three-year moving average, we lose another year. To obtain more recent data for analysis of the latest fertility trends, the authors developed a simple procedure which allows estimating the adjTFR for an additional year. They calculate first the crude $adjTFR$ using $r_i(t) = MAC_i(t+1) - MAC_i(t-1)$. And to improve the last year estimate slightly, we should use a smooth, computing the average of the last two full observations combined with this very last point:

$$adjTFR(est)(t) = \frac{adjTFR(t-1) + adjTFR(t) + crude_{adjTFR(t+1)}}{3}$$

[3]

Goldstein and Cassidy (2010) inspired by Rodriguez (2005) suggested a model that can be easily extended to include the variation in postponement by age within each cohort and also period effects on the quantum of fertility. In this article the authors present the cohort shift model with period quantum effect, they “introduce an adjusted measure of period total fertility which can be used to recover the total fertility that would have been observed in the absence of postponement”. Bongaarts and Feeney (1998) proposed a model with the age shift in the period, while Goldstein and Cassidy (2010) proposed a model were the age shift occur in cohort.

Assuming that $f(a,t)$ will be used to denote fertility rates at age a and time t .The time t it will be equal to $c+a$ so the fertility at age a of a cohort born at time c will be $f(a,c+a)$. Considering finally that $S(a,c)$ is a function of cohort, i.e. $S(a,c) = S(c)$ and that we have completed cohort data, the $TFR*(t)$ is:

$$TFR^*(t) = \int f(a,t).\left(1+S'(c)\right)da \qquad [4]$$

were the $S'(c)$ can be approximated using the change in cohort mean age at childbearing.

When we are in a situation of incomplete cohort data, Goldstein and Cassidy propose the calculation of a ratio of partial derivatives for values of a and t such that $-a = c$:

$$\frac{f_a(a,t)}{f_a(a,t)+f_t(a,t)} \qquad [5]$$

This ratio gives an approximation of the factor $1+S'(c)$.

The differential cohort behaviour can be observed in the recent upswings in total fertility rate from increasing fertility at older ages. Such behaviours carry us to diverge from the $adjTFR_t$, and from the explanation that period fertility is not only affected by the tempo and quantum effect but also by the cohort behaviour. One of the possible explanations for the increase of fertility at older ages is that the cohorts are recuperating the births postponed in these same cohorts when women were younger. The idea that cohorts are postponing fertility at younger ages and recuperating later at older ages will be discussed in the next chapter.

POSTPONEMENT AND RECUPERATION

The massive postponement and recuperation of childbearing in countries with low-fertility characteristics have been important developments from the sociological and demographic perspective in the end of the last century. The rapid changes in fertility level and tempo during the last decades have often been described from a period perspective. But they can be equally well captured trough the transformation of cohort fertility patterns, which may in turn be translated to the observed period fertility shifts.

Therefore in not simple or easy to differentiate in a period perspective between the temporary depressing effect of shifting timing of childbearing (tempo effect) and the real decline of fertility (quantum effect). As already mentioned in the previous chapter, Bongaarts and Feeney initiated in 1998, an application of methods to develop tempo-adjusted period total fertility rates that remove the depressing effects of changes in childbearing timing. Authors as Bongaarts and Feeney focus their methods in a period fertility perspective that provides the possibility to observe fertility change over time. However the cohort perspective which is repeatedly neglected provides a similar contribution. In contrast to the period approach, “the cohort approach does not need any recourse to statistical constructions such as a synthetic cohort” (Sobotka et al 2010). Nevertheless the major problem of the cohort approach is the long period of ‘waiting time’ until the cohort completes the reproductive history.

The solution to the different problems presented is the ‘combination’ of cohort and period perspectives is a method that “follows of childbearing postponement and recuperation and its reflection in total period fertility levels and trends in low fertility populations” (Frejka, 2010). These methods are methods were through the analysis of the fertility cohorts we have the possibility to better understand the fertility period behaviour. The different methods related to the postponement and recuperation perspective have been developed and followed by several authors and in different perspectives (Lesthaeghe 2001, Frejka and Calot 2001, Frejka and Sardon 2004, Frejka 2010, Sobotka et al. 2010).

If in period fertility the keywords are ‘tempo’ and ‘quantum’, in cohort fertility the keywords are ‘postponement’ and ‘recuperation’. The postponement is measured by cumulating absolute or relative fertility decline across all ages when fertility has fallen, and the recuperation is measured by cumulating absolute or relative fertility increases across all ages when fertility has increased relatively to the reference cohort (Sobotka et al. 2010). A vast number of empirical results and graphs can be combined to analyse different characteristics of cohort fertility change by age and parity.

Lesthaeghe (2001) suggest a model of cohort fertility postponement and recuperation, from the point of view of the start of postponing process, observing the way that these two factors develop across different and consecutive cohorts. The paper from Lesthaeghe proposed a relational model of cumulative cohort fertility deviations relative to the schedule of a benchmark cohort, using two scalars to manipulate a standard deviation schedule before and after the age of 30 (Sobotka et al. 2010). The benchmark cohort is defined as the cohort experiencing the onset of first postponement of births. The model planned was a parsimonious model but presented some constrains related with data limitations using only five year age groups and also the lack of party specificity, however the philosophy of the relational model can willingly applied to parity specific schedules as well.

The method proceeds with the differences $d_c(x)$ in the cumulative fertility $F_c(x)$ between the observed cohort c and the benchmark cohort b ($F_c(x)$- $F_b(x)$). The schedule of the differences by age is referred as the 'deficit function' of values of $\mathbf{d}_c(x)$ for each cohort c. Consequently, a standard deficit schedule is chosen for each country in the study, denominated $d_n(x)$, and is taken as representative for the underlying age pattern in all schedules $d_c(x)$.The observed $d_c(x)$ and the national standard $d_n(x)$ schedules are related to each other by two parameters. The postponement scalar PR_c manipulates (accelerates or decelerates) the degree of postponement as defined in the national standard d_n for all ages below 30, and the recuperation scalar, RR_c determines the degree of fertility recuperation above age 30.

Figure 3 illustrates the method itself where we can observe the two cumulated trajectories of fertility by age trajectories are related to the benchmark cohort b. The trajectory $\mathbf{d_n}$ is defined as an average value over two cohorts, were the first is the younger cohort that reach at age of 40 at the time that the data is available and the second cohort is the cohort born five years earlier. So the $d_n(x)$ is computed as a difference between cumulated fertility $\mathbf{n}$ and the benchmark cohort b :

$$d_n(x) = \sum_{12}^{x-1}[f_n(x) - f_b(x)] = F_n(x) - F_b(x) \qquad [6]$$

And by analogy to a cohort younger than a benchmark cohort b, its deviations from the fertility schedule can be computed as:

$$d_c(x) = \sum_{12}^{x-1}[f_c(x) - f_b(x)] = F_c(x) - F_b(x) \qquad [7]$$

And by definition, the deviations of the benchmark cohort b at any age x are set to zero: $d_b(x) = 0$

For ages $x \geq m$ the absolute value of recuperation, as compared to the benchmark cohort, can be computed for any cohort $c > b$:

$$r_c = \sum_{m}^{x-1}[[f_c(x) - f_b(x)] - [f_c(m) - f_b(m)]] = d_c(x) - d_c(m) \quad [8]$$

By analogy, the absolute recuperation can also be derived for the national standard schedule, and by definition the recuperation is 0 at age m :

$$r_c = \sum_{m}^{x-1}[[f_n(x) - f_b(x)] - [f_n(m) - f_b(m)]] = d_n(x) - d_n(m) \quad [9]$$

This model presents also two indicators that show progression in the rhythm of postponement and recuperation at different ages across cohorts, the Postponement Ratio PR_c and the Recuperation Ratio RR_c. The postponement ratio can either be measured at ages lower than the age m ,when its trajectory reflects the fertility decline.

$$PR_c = \frac{d_c(x)}{d_n(x)} = \frac{\sum_{12}^{x-1}[f_c(x) - f_b(x)]}{\sum_{12}^{x-1}[f_n(x) - f_b(x)]} = \frac{F_c(x) - F(x)}{F_n(x) - F_b(x)}$$

[10]

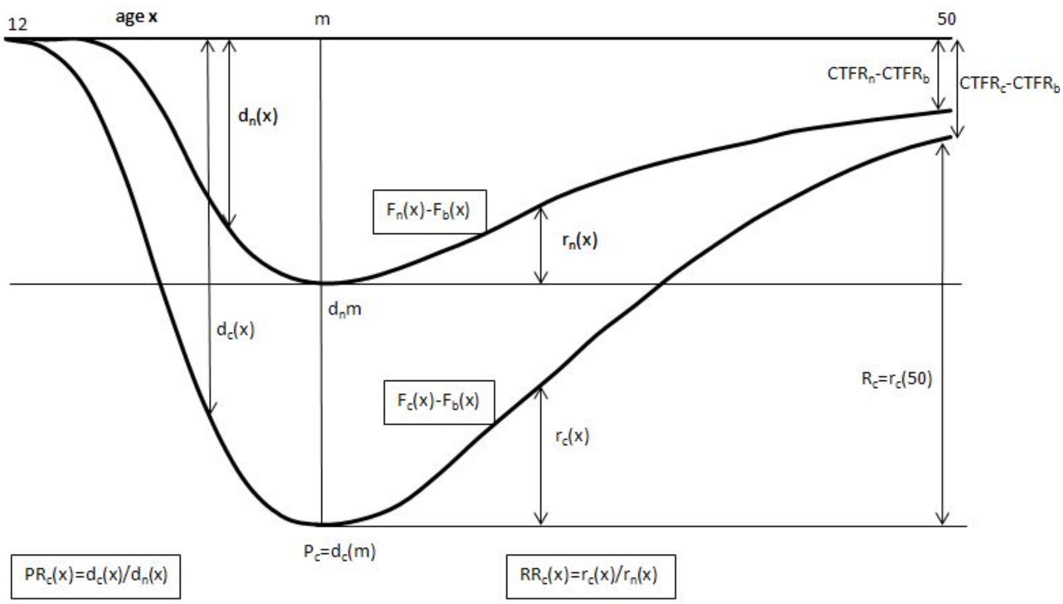
In contrast the recuperation ratio is measured only at ages $x > m$:

$$RR_c = \frac{r_c(x)}{r_n(x)} = \frac{d_c(x) - d_c(m)}{d_n(x) - d_n(m)} = \frac{\sum_{m}^{x-1} f_c(x) - f_b(x)}{\sum_{m}^{x-1} f_n(x) - f_b(x)} \quad [11]$$

Both ratios equal to 0 in the benchmark cohort and equal to 1 in the national standard schedule: $PR_n(x) = 1$; $PR_b(x) = 0$; $RR_n(x) = 1$; $RR_b(x) = 0$.

The relational model proposed by Lesthaeghe and briefly presented here, describes the evolution of cohort postponement and recuperation related to the degree of postponement and recuperation in the national standard schedule of deviations.

Figure 3: Graphical illustration of the cohort postponement and recuperation as conceptualised in the relational model based on Lesthaeghe (2001)



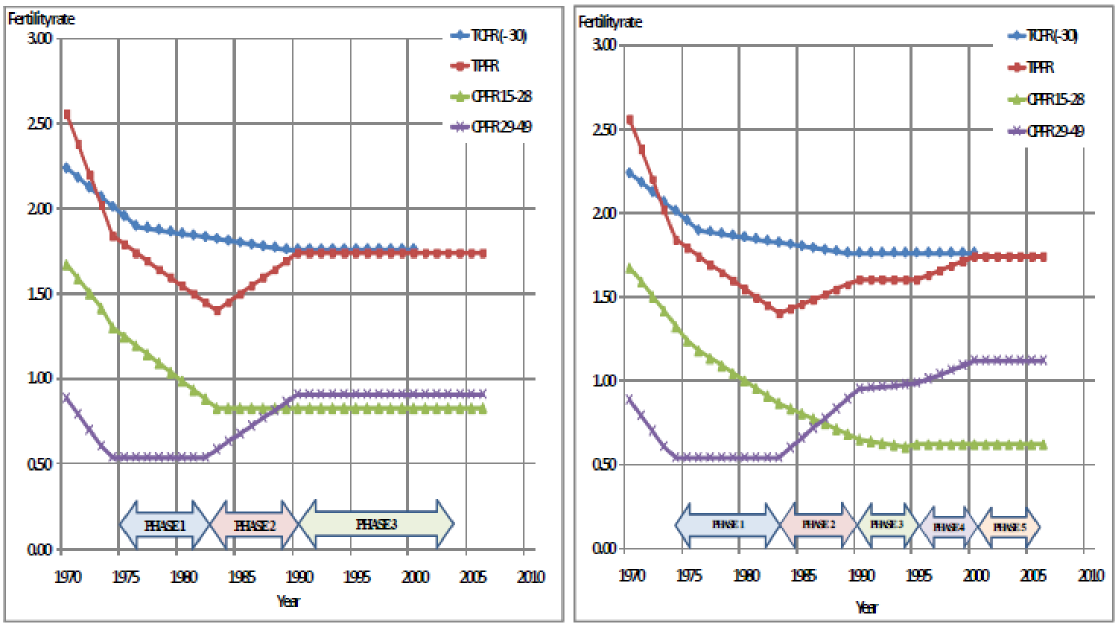
Source: Reproduced from Sobotka et al. (2010):Figure 11

Frejka (2010) provides and empirical research of period and cohort fertility transformations across all developed countries[1] and outline two patterns of fertility. A simple method with three phases and a complex with five phases, these two models (figure 4) captured in a refined way the transformation of fertility in regions with an early inception of childbearing postponement, particularly in North and West Europe and in some of the countries from South Europe.

[1] The countries used in Frejka investigation were those who have available data, and among these countries the author created four main groups of countries: Western Countries, Southern Europe, Central and Eastern Europe and finally East Asia. In the Western countries are included the Nordic countries (Denmark, Finland, Norway, Sweden); Western Europe (Belgium, England & Wales, France, Netherlands); the West Central Europe (Austria, West Germany, Switzerland); Non-European Countries (Australia, New Zealand, Canada, United States). In the Southern Europe the countries included are: Greece, Italy, Spain and Portugal. The third group is divided in East Central Europe (Czech Republic, East Germany, Hungary, Poland, Slovak Republic); Eastern Europe (Bulgaria, Romania, Russian federation); West Balkan Region (Croatia, Bosnia & Herzegovina, Slovenia, Yugoslavia). The East Asia includes countries as Japan, Taiwan, South Korea and Hong Kong.

Figure 4: Simple and extended models depicting phases of postponement and recuperation[2]

(a) Simple Model (b) Extended Model



Source: Reproduced from Frejka (2010):Figure 4

The simple model consists of three phases. (1) The ‘declining period fertility’ where the childbearing is being postponed among young women resulting in the decline of fertility. (2) The ‘rising period fertility’ is the moment were young women have stopped to postpone births and their childbearing is at a relatively low level and the fertility trend is stable. (3) In this phase the older women are recuperating the postponed births from when they were younger. (4) The final phase from this model is the ‘stabilized period fertility’ is the moments were the childbearing recuperation has come to an end and there is no childbearing postponement among the younger women. It is in this last phase that the total cohort and period fertility rates settle with similar values.

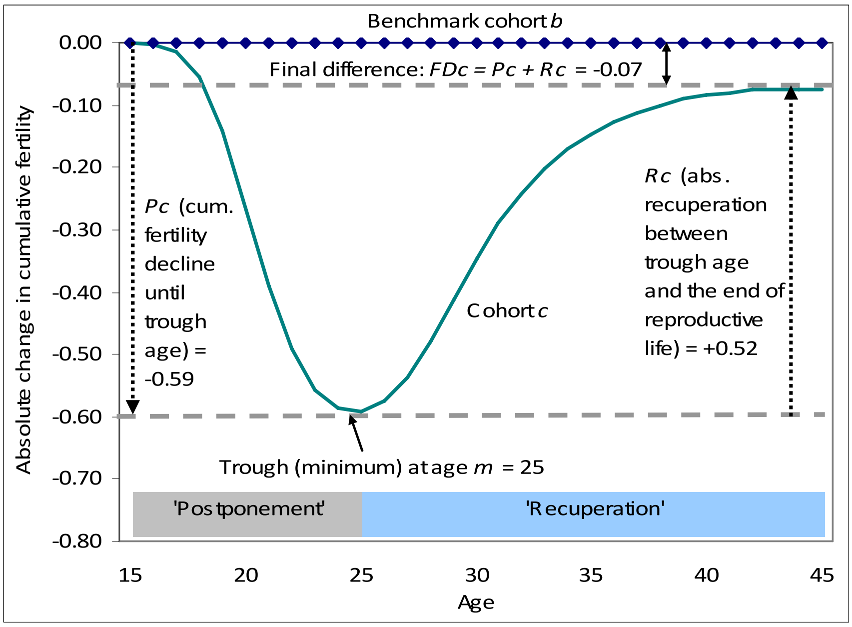
The extended model proposed by Frejka to analyse the postponement and recuperation of fertility consist of five phases. (1) The ‘declining period fertility’ and like in the simple model the younger women are postponing fertility, even though the values of period fertility remains stable at older ages. (2) The ‘initial period fertility increase, were the postponement continues but as a slower rate, and the older women are recuperating births they had postponed at younger ages. The interplay between postponement and recuperation is reflected in a partial total period fertility rate. (3) The ‘interim stabilization of period fertility’ reflects a postponement and recuperation that are continuous and present similar rates for decline or increase. (4) The ‘final period fertility increase’, were the young women have stopped the

[2] The total cohort fertility rate lagged by 30 years, total period fertility rate, cumulated fertility rate ages 15-28 and cumulated fertility rate ages 29-49.

postponement and their fertility trend is stable. Older women are also continuing to recuperate the postponed births. This combination results in the increase of total fertility rate. (5) Finally the 'stabilized period fertility' happens and the childbearing recuperation come to an end, and the postponement among younger women no longer exists. The cohort and period fertility rate are finally at the same level.

In a simplistic way we can assert that this two different approaches (graphical and statistically) proposed by Lesthaeghe (2001) and by Frejka (2010) are complementary methods useful to describe cohort fertility changes over time. Therefore Sobotka at al. in 2010 with the propose to create new analytical method, combine the two approaches presented. The 'new' model presented by Sobotka et al. (2010) start to be defined with base in a simplified scheme of cohort postponement and recuperation (Figure 5) were we can observe the delineation of which part of fertility decline at younger ages (P_c), which part has eventually been recuperated later in life (R_c) and finally which decline turned out to be permanent.

Figure 5: A simplified scheme of cohort "postponement" and "recuperation"



Source: Reproduced from Sobotka et al (2010):Figure 1

From the indicators presented in the figure 5 we should do a brief explanation of them and introduce different indicators. Therefore, and taking into account figure 1:

- P_c is the decline in cumulated cohort fertility of cohort c compared to that of the benchmark cohort b at the trough age m. P_c measures the maximal difference in cumulated fertility between the benchmark and the observed cohort.
- R_c is the recuperation measure or the absolute increase in cohort fertility, as compared to the benchmark cohort b, between age m, the trough age, and the end of the reproductive period: $P_c = \sum_{x=12}^{m} [f_c(x) - f_b(x)] = F_c(m) - F_b(m)$
- FD_c is the f*inal difference*. Is the permanent difference, usually decline, in fertility between the benchmark cohort and the cohort of interest, computed as $FD_c = P_c + R_c = CTFR_c - CTFR_b$. It can also be computed as a non-recuperated portion of the 'postponed' fertility, using the recuperation index specified below: $FD_c = P_c . (1 - RI_c)$

However is also important understand what is:

- b is the Benchmark cohort. This is the first cohort that experienced an increase in the mean age at first birth that continued for at least five cohorts.
- $F_c(x)$ is the cumulated fertility rate (number of births per woman) up to age x in any cohort c: $F_c(x) = \sum_{x=12}^{x-1} f_c(x)$, where $f_c(x)$ is the age-specific fertility rate of cohort c at age x.
- m is the age at which the gap between the cumulated fertility rate of the benchmark cohort and of the observed cohort reaches a maximum.
- $F_c(m)$ is the cumulated fertility in cohort c up to age m of the trough.
- RI_c *is the recuperation index* and measure the degree of *recuperation* relative to the *decline* at younger ages: $RI_c = R_c / P_c$. It can also be expressed as a percentage, ranging from 0 (no recuperation) to 100 % (full recuperation) or even above ('over-compensation').

The methods described herein are useful for the description of the ongoing process of cohort changes in the most developed countries, but also see a need for further development. Graphical representations and the indicators of postponement and recuperation can be employed in a variety of contemporary settings, leading to more rigorous analyses of cohort fertility transformations. The shift of fertility to a later childbearing age (postponement) constitutes a potential problem when studying the period fertility changes as the intensity with which births are being shifted to later ages has a temporary depressing effect on a period fertility rate (Sobotka et al. 2010). These problems are starting to be overcome using methodology that includes period and cohort fertility perspectives. Nevertheless and although in general the fertility decline is related with the postponement the truth is that this decrease is dependent of other factors. Modelling the postponement transition, using selected social, economic and cultural variables along with the key indicators of postponement process constitutes a promising extension of these models. The factors motivating fertility recuperation have been overlooked and the social or economic measures implemented in some countries with situations of lower fertility can be one of the explanations for the actual recuperation. Is about the impact of families' policies and the economic fluctuations that the next chapter will be focused in.

ECONOMIC IMPACT

Becker in 1981 interpreted the fertility reduction "as a rational behaviour of individuals by explaining that the impact of an increase in individual income on fertility is subject to a quality-quantity trade-off". Fertility affects population growth and the age structure of the population in general the evolution of fertility in the nearest future has far-reaching consequences on the economic development, productivity growth and several aspects of the welfare systems (Prskawetz et al. 2008). Fertility response to economic development is not similar and many factors shape the relation behind and above the economic (Lesthaeghe and Surykin 1988). A qualitative change in the context of economic growth changes the environment of its influences on fertility rates. These changes occur because economic development and fertility are linked in a two way relationship. On one hand, the changes in population composition caused by the fertility variations, affect the level of investments in education, and we can say that fertility affects in the long term the economic growth. On the other hand the economic growth affects the fertility behaviour (Luci and Thévenon 2010).

The levels of low fertility in Europe are leading to important changes in age structure and to slowing or repressing population growth. The immediate impact of low fertility is the reduction of the number of children in the total population and increase the share of the population concentrated in the working ages, raising support ratio and correspondingly raising per capita income. This phenomenon is identified as the first demographic dividend. Afterwards, as the smaller cohorts of children reach the working ages, the share of working age population declines, the share of older adults increases, the total population ages and in a general way the support ratio falls, reducing the per capita income. The shifts of population age distribution have significant macroeconomic consequences that feature prominently in the debate of the economic attitude in Europe. In the conventional literature, the low fertility leads to higher capital consumption because slower labour force growth leads to capital deepening. However the lower population growth may reduce the welfare because the workers have to support a larger number of elderly (Lee and Mason 2010).

Nevertheless the research on economic recessions shows that the economic crisis can affect the dynamics of migrations, mortality and fertility. The research on the effect of economic recessions on fertility provides the support to the idea that fertility reacts negatively to the downturns of the economic cycle, exist a 'pro-cyclical relation' between fertility and economic growth. The negative relation between fertility and economic crises has also been observed in historical studies related to the 19th and beginning of the 20th century (e.g. Lee 1990, Bengtsson et al. 2004).

The idea that fertility reacts positively to economic prosperity and falls in times of crisis had been follow for centuries. "Adam Smith linked the economic development growth with the 'multiplication of the species'. Becker (1960) compares children to 'durable goods' demands for which would increase with a rise in family income with a decline in their 'price'. Easternin (1976) emphasizes the role of income relative to economic aspirations of the couple/family. In this perspective the fertility varies with the relative affluence of the younger cohort, which is gauged against their childhood experiences from their parents' household. In contrast Butz and Ward (1979) suggested that fertility is likely to become countercyclical with rising employment of women. Economic good periods would be most expensive to have children and period of prosperity would therefore be associated with the lows in fertility rates" (Sobotka et al. 2009).

The actual economic crisis is in many ways different from the previous, mainly because is a World crises that affects all the markets around the world. These economic recession raises interest on the effect of such variations in the economic context in demographic behaviour. As result of the recession, the economic growth has slowed down and the unemployment levels have risen roughly. So in a period of adverse economic conditions, is plausible that the families put the decision to have a(nother) child in hold (Neels 2010).The institutional and cultural context in the developed countries is significantly different than at the time of precedent crises. More women than ever are participating and competing with men at the labour market; the majority of couples use contraception that facilitate them the postponement of their childbearing; the welfare systems are getting increasingly more and more depend of the social security and health costs linked to the rapidly increasing number of elderly. In many European countries the actual crisis coincide with pension system reforms whyich in fact increase the age of retirement, implying that fewer older workers are leaving the labour market and the younger have to compete for less jobs and accept inferior earnings. Every one of these factors affects the reproductive decisions, potentially enhancing the negative effects of the recession on fertility.

Although most studies find that fertility tend to be pro-cyclical and react on the ups and downs of economic movements, the evidences are not unanimous. The fertility trends often show correlation with the gross domestic product (GDP) growth. The relationship for low-fertility countries after 1980 revels that periods of economic recession or stagnation were frequently followed within one or two years by a turn down in the period fertility rates. Nevertheless, the measures of unemployment and consumer reaction appear to be suitable indicators that reflect directly the impact of the crisis on individuals and that were repeatedly found related to fertility swings (Sobotka et al. 2009). New patterns of fertility are marked by the end of postponement of childbearing, by new economic and social dimension and by modern norms and attitudes towards the family, female education, and gender roles.

The GDP is often the indicator measured to analyzed the economic decline frequently with a subsequent fall in fertility rate. In a study about 26 countries with low-fertility levels (Sobotka et al. 2009) has been identified that on average the period TFR decline is more often than the increasing. However, this association often dispersed in a multivariate model, when other indicators, capture better the pathway trough which economic recession affects fertility are induced. Different from the changes in the GDP, the unemployment growth constitutes a more concrete indicator of the impact from economic crisis which has a direct result in the behaviour from women and men in reproductive ages. Persistent and high unemployment among young adults has become one of the most significant explanations for the low and delayed partnership and family formation in Southern Europe (Billari and Kohler, 2004).The rising unemployment contributes to the delay in partnership and marriage, which indirectly influences the decline of fertility rates. Delayed partnership formation has most salient effect on birth trend in countries where the traditional tie between marriage and childbearing remains strong. If until recent years this patterns was typical of Southern Europe, where the marriage was commonly seen as a precondition to childbearing (Castro Martin, 1992) in recent years outside Europe, countries of East and South-Asia has experienced a remarkable postponement and decline in marriages, which explain the decline of fertility in the last decades (Kaneko at al. 2008).

In a recent study (Luci and Thévenon, 2010) about the economic development and fertility in the OCDE countries, the authors follow and econometric strategy, with a linear, an exponential and a quadratic models. The aim of the proposed models was to observe the relationship between the total fertility rate (TFR) and the GDP per capita ($GDPpc$). In a generic way this study makes it easy to understand that the influence of economic development in fertility changed radically in the last few years. In highest developed countries, economic evolutions and setbacks goes 'hand by hand' with rebound in fertility.

The current recession is likely to have some depressive effect on the childbearing and period fertility rate that are already deemed too low to values even lower in the near future. In many countries where the TFR increased after 2000, may lead to marked decline because of the recession. Nevertheless the effects of the recession will not be 'universal', the institutional factors and policies will interfere in the relationship between economic depression and fertility behaviour.

FAMILY POLICIES

The public policies have an undeniable effect on the societies and families. In a general way the policies regulate the conditions of employment, define the dimensions of welfare benefits, provide education and health services and define the rights and responsibilities of parents. Yet in some cases the public policies have been claimed to have a perverse effect on families. The relation between public policies and demographic behaviour, are however, especially complex. Relation between public policies and the demographic behaviour depends on type of policies, the level of benefits, conditions of eligibility, and the income and opportunity sets of individuals (Gauthier 2007). The population policy includes measures that are design to have an impact on population structure, and of which the fertility rate is the most relevant indicator. Also the term ‘family policies’ is used to emphasize that government policies frequently do not aim specific goals in terms of the population size and structure, but are only concerned with family well-being and resultant activities that are directed towards families with children. And in the majority of the countries the family policies usually do not constitute a distinct policy area.

Once that family policies are a fundamental part of welfare-state policies, is useful to draw on the European context a classification appropriated to each type of society. This classification has been identified by Esping-Andersen (1999). The European countries can be clustered into four different regimes according to their social policies: (1) in the Nordic countries, the called universalistic welfare states; (2) in the Continental European countries the prevalence was to conservative welfare states; (3) the Anglo-Saxon countries were typically liberal welfare states; (4) the Mediterranean countries identified as the Southern European welfare states.

The universalistic welfare states are characterized by welfare-states policies that are targeted at individual independence and social equality between all the individuals. The conservative welfare states direct their policies in the direction of status preservation and the protection of traditional family forms, and they often rely heavily on the family as a provider or welfare. The liberal welfare states encourage market-based individualism trough minimal social benefits and trough subsidizing private and the social benefits are frequently related with poverty. The Southern European welfare states are often considered part of the conservative regime, but because of their stronger familial merits they are viewed as a separated welfare-state regime. This classification of the family policies reflects on the number of births that have occurred over the past decades in European countries. The Nordic countries with their social security systems tend to have a universal relatively high fertility in contrast to Southern Europe where the welfare regimes are associated with very low fertility values, and in-between are the West European countries with a moderately high fertility.

Even though the family policies are part of the welfare-state, they are spread in a different number of political fields and one of them characterized by a different historical and development path. This enormous diversity has made hard for researchers the task to arrive at a common definition. Among the different attempts to conceptualize family policies, Neyer and Andersson (2008) highlight three contributions that seem to be the most relevant to demographic research.

1) Kamerman and Kahn define family policies as, all the actions that the government does to and for the family (e.g., day care, child welfare, tax benefits). They interpreted the family policies as the sum of all state activities direct to the family core. The approach of these authors draws attention to the range of family policies in the industrialized societies.
2) Bourdieu indicate that because family policies are direct to the family, in the end they also construct the family. He considers that family policies as state measures to assemble and institutionalize a particular form of family as the established form of private relationships in a society. This approach indicates the need to examine the cleavages between the social, the normative and the family policy improvement in a country. The fertility effects can be frail or insignificant if policies do not correspond to the social life that the majority of the people in a country want to lead or if the family policies oppose the norms that conduct most people's lives. In these context Neyer and Andersson (2008) present an example about Germany and Austria, both countries "have been among the countries with the lowest total fertility rate, yet the highest expenditures on family policies in Europe may be attributed to discrepancies between social developments and the orientation of the policies on the other hand and the perception of the family policies on the other".
3) Feminist welfare-state researchers and following the ideas of Esping-Andersen (1999) add two additional aspects. First they give emphasis to that family policies constitute a central part of the welfare-state context in a country. They focus their attention in family policies by taking into account the effects that family policies have on gender, class, race, and other social, economic, and private affiliation in society. Second, these researchers underline the need to decompose the family concept. These feminist welfare-state approach stress that family policies my not necessarily influence directly the fertility, can be an effect mediated through other social institutions.

One of the most defend family policy is the maternity and parental-leave however this regulation, across all the European countries seem to be accepted as a measure to regulate the female labour participation and as a resource to organize employment and care along gender lines. The policies of the Nordic countries have been oriented to support women's employment, however many continental European countries purpose the opposite goal. The laws in many European countries contain indirect restrictions on father's absorption of parental leave (e.g., low benefit levels or impractical rules regarding parent-leave). In many countries, the family policies differentiate between social groups, between public and private sector (e.g., Portugal), married and non-married or national and foreigners. To the demographic research these examples illustrate that whichever analysis of policy effects should be based on careful study of policy system, of their range, and their potential impact on family, social and economic relationships.

Demeny (1986) argue that fertility behaviour was "a legitimate object of attention for collective and, in particular, governmental action". And Chesnais (1996), states that "the gap between the ideal and the reality (in terms of number of children) demonstrates that public policies have failed to remove the obstacles to realization of fertility desires". Although leadership come inevitably from governments, the ideal arrangement should be a partnership between families, governments and employers promoting the existence of friendly family policies. Generous social policies could create a socioeconomic environment that provides increased incentives for having children, including child-care provision, better access to labour markets for women with children, and transfers to families with children. Due to the relatively low levels of childlessness, these policies in lowest-low fertility countries should be targeted in particular towards the realization of delayed first births at higher ages and the progression from the first to the second child (Kohler et al. 2002).

McDonald (2000) suggest five financial incentives to help increasing fertility, (1) periodic *cash payments;* (2) *lump sum payment* or *loan;* (3)*taxes rebates, credits or reductions;* (4) *free or subsided services or goods for children;* (5) *housing subsidies.* The author suggests also measures related to work and family initiatives, and broad social change supportive for children and parenting. With respect to the suggest about strategies related to the work and family initiatives, is easy to identify the universalistic welfare states from the Nordic European countries, were we observe the maternity and paternity leave; a higher support in child care; the flexible working hours and short-term leave for family purposes; or the anti discrimination legislation and gender equity in employment. On the other hand and with respect to the broad social change supportive of children and parenting, we identify the Southern European countries were exist employment initiatives or marriage and relationship support. In Spain, e.g. in 2007 to encourage families having more children the government created new measures that included 2,500€ for each new born (Goldstein et al. 2009). The "supposed" effect was felt in 2008 with an increased value of 5 percent in total fertility rate.

The total fertility rate is sensitive to the timing of birth, so if a women decide to postpone childbearing to a later time in their life, then the TFR decrease irrespective of changes in family policies or unemployment. In this perspective the higher pressure to respond with policy changes to the low fertility exist in the Southern European and conservative welfare regimes. In this context Grant et al. (2004) proposed: (1) improver's policies that aimed to accommodating and improving the consequences of low fertility, population decline and population aging; (2) preventive policies, which can be direct such as migration policies, family support, reproductive health and family-friendly employment policies, or indirect, such as economic, gender and educational policies.

In contemporary Europe, the explicit pro-natalistic policies have met pronounced public resistance. Family policies in the European context tend to be based on an equal-opportunity rationale and aim to help women combining childbearing with employment opportunities. "What public policies could help stop the increase in the mean age at childbearing or even to a decrease in the near term?" (Lutz and Skirbekk, 2005). All the studies produced in the last decade suggest some levels of success for a particular policy measure in a particular country and year. It's difficult from the point of view of the literature review to present an accurate political measure and an adequate model to the impact of the policies in the fertility behaviour. The measurement of policies is the major challenge in all studies, which tend to be restricted to only type of policies. "There are no appropriate contextual and policy indicators that capture the development of such differences over time and that are suitable for application in fertility research that involves many countries" (Neyer and Andersson 2008).

FERTILITY PROJECTIONS

Demographers typically refer to information about the future as *projection* or *forecast*. These two terms are often used indistinctly they can be differentiated according to the expected likelihood of the outcomes. A *projection* can be defined as the numerical outcome of a particular set of assumptions regarding the future population. Is a conditional calculation showing the future based in a set of specific assumptions. A *forecast* can be defined as the projection that is selected as the most probable to provide an accurate prediction of the population. The projection is a more complete term than forecasting, "all forecasts are projections but not all projections are forecasts" (George et al., 2004).

The projections are classified as: (1) the trend extrapolations that are based on the observable historical trends; (2) the cohort-component methods divide the population into age-sex groups or birth cohorts and accounts for the behavioural fertility, mortality or migrations in each cohort; (3) the structural models rely on observed relationship between demographic and the other variables. This classification is not so usual mainly because is often that the application of the cohort-component method incorporate the trend extrapolations, and the structural models are often used in conjunctions with the cohort-component method. Beside the previous presentation of the three classifications for demographic projections, our attentions will be focused in the second method, the cohort-component method.

In fertility projection we can use the period perspective, a cohort perspective, or the combination of both. Although the cohort perspective is superior for some analytical purposes, it is difficult to implement when constructing population projections. The data need to a completed cohort fertility don't became available until after a cohort has passed through all childbearing years, this means that only after age 50, the women have completed the fertility cohort. In addition to this first problem, the projections of fertility for sub national areas are complicated by the lack of data, and by the effects of migrations, which may have an important impact in the fertility behaviour. Due to these problems and the complexity of the methods, most researchers use the cohort-component method with period perspectives. One of the approaches of the cohort-component component is to extrapolate historical trends. This approach is useful for countries in the middle of a demographic transition from high to low fertility levels, however in countries were the transition is already completed can lead to some problems.

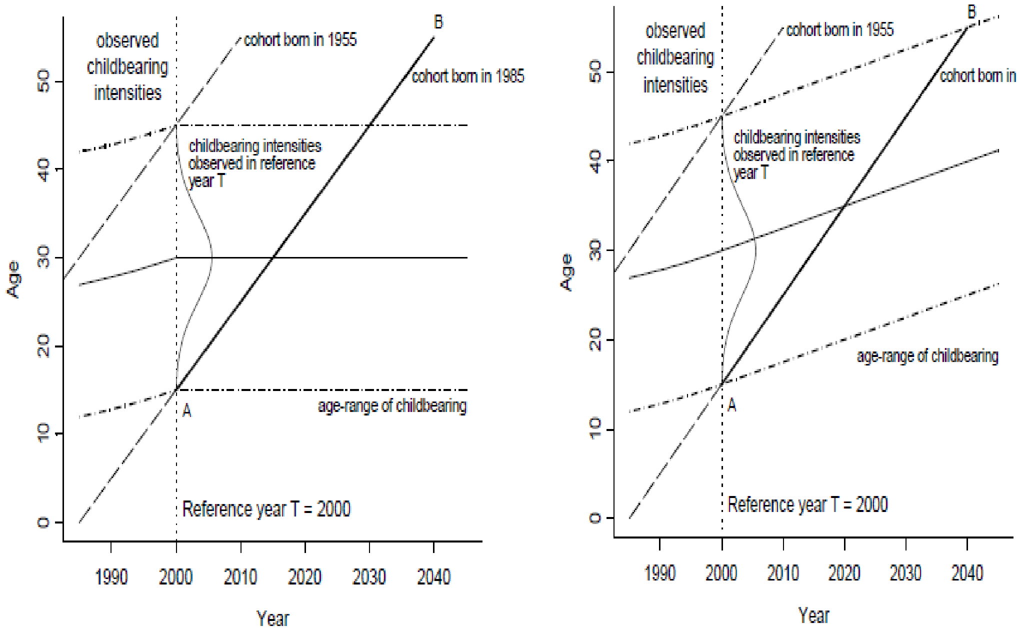
The combinations of cohort and period fertility perspectives is useful, and we must take in consideration that there is a improved use of cohort approach in the European Economic area, a development partially attributed to the availability of long series of historical data George et al. 2004). If it is important understand the relationship between period and cohort observations of fertility because this is essential to identify trends and scenarios. Is also in actual fertility observe the most complex problem that is related to structural changes in the trajectory of total fertility (quantum), in the changing age patterns (tempo) and in the complex association between this two. Inspired by the tempo effect in fertility, and using a cohort-component method with trend explanations, Kaneko (2010) proposed a fertility projection model to measure and understand the period effect in terms of modifiers of the cohort fertility schedule in Japan. Using the period effect analysis composed with fertility projections system, it is estimated by the author that the recent upturn in Japan can be explained by the period effect, which does not change the completed cohort fertility, and particularly the effects that cause temporal shifts and are recuperated in other periods.

Kohler and Ortega (2002) proposed a tempo adjusted period progression measure that could be used to (1) analyse the past period fertility trends in terms of a synthetic cohort measures, and (2) project the timing, level and distribution of cohort fertility conditional on a explicit postponement scenario. The authors based their analysis on a parity and age model of fertility that can lead to net fertility aging effects. The aim of the authors was to analyses the cohort fertility under different postponement scenarios, establishing the relations between the childbearing intensities experienced by the cohorts and the adjusted intensity schedules in a reference year. The adjusted intensity schedule is a product of an age-pattern and level effect of childbearing intensities, theses two determinants combined with specific hypothesis about the future can be used to characterize the intensities that are experienced by the cohorts. Based in these parameters, the authors suggested two possible postponement scenarios (figure 6), the postponement stop scenario and (b) the postponement continues scenario.

The postponement stop scenario assumes that any postponement that occurs in year T comes to the end and that there is no more postponement of fertility during the life course of the cohort. In the opposite, the postponement continues scenario presuppose that the mean and variance changes observed in the year T prevail in the future.

Figure 6: Postponement stops and postponement continues scenario in the Lexis diagram

(a) postponement stops (a) postponement continues



Source: Reproduced from Kohler and Ortega (2002):Figure 4

As referred above the cohort analysis forces the researchers to be very accurate about the future of each incomplete longitudinal set of life cycle. Sobotka et al. (2010) attempt to solve this problem by proposing two scenarios based in analytical approaches to cohort fertility: (1) projections using the main indicators from postponement-recuperation analysis; (2) projections of the cohort fertility schedules using the relational model of fertility. In the first approach the authors suggest the elaboration of cohort projection scenarios when the process of postponement transition is in progress. For every cohort which have achieved the maximum of fertility decline relative to a benchmark cohort, the completed fertility rate $(CTFR)$ at a given birth order i can be projected as:

$$pCTFR_c^i = CTFR_b^i + P_c^i(1 - pRI_c^i)$$

[12]

were b is the benchmark cohort, RI the recuperation index and P the maximum decline in cumulative fertility relatively to the benchmark cohort. These first model presents however four shortcoming that the authors themselves draw attention. (1)When based on the observed values of P and projected for values of RI , the projections will not extend into the young birth cohort of women in their early ages. (2) This model is design for the countries that are still experiencing the postponement transition and will not work well for countries without long-term and systematic shift in the cohort timing of births. (3) It also does not perform well in the early stages of postponement shift, were any of the cohorts analysed have achieve the later reproductive ages and therefore the recuperations index cannot be computed. (4)Finally the problems with the extremely sensitiveness to the data quality in order-specific projection.

The second approach proposed by Sobotka at al. (2010) is a complement of the first approach by using the relational model of cohort postponement and recuperation. Here the idea is to project the postponement ratio at age 40 or the recuperation ratio at age 40, and with these projected ratios recalculate the age-specify fertility rates and cumulated fertility at age 40. However the method here proposed uses the postponement ratios across all reproductive age. The authors use a linear regression to predict the postponement ratios PR to the future part of the fertility schedule, and using the $PR(x-1)$ as an explanatory variable turned out to be considerably more promising with respect to stability of results. If sufficiently lengthy cohort data series have accumulated after the benchmark cohort, we can use the approach to predict step-by-step the postponement ratios for each cohort and age:

$$pPR_c(x) = \alpha \times PR_c(x-1) + \beta + \varepsilon$$

[13]

This approach and in the same way as the first one presents some drawbacks, ignoring the theoretically useful distinction between the postponement and recuperation phases although this disadvantage balanced by a higher stability in the projection.

Similarly to what happens in the domain of the family policies, the models for fertility projections, nowadays are not universals and many of the differences between countries are due to the evolutions of the tempo and quantum effect in period or in evolution of the postponement and recuperation in the cohort.

SUMMARY

The tempo distortions provide an explanation of lowest-low fertility and play a key function in recent TFR reversals. However the measure proposed by Bongaarts and Feeney in 1998 preset problems with estimating the TFR related with the parity. The model proposed by

Goldstein and Cassidy (2010) is an innovative model with the age shift in the cohort to obtain more accurate results.

The postponement transition process can be illustrated by several key order-specific indicators that capture the progression of this transition, in particular, the fertility level of the benchmark cohort, the size of younger-age fertility decline, and the degree of recuperation at older ages. However theses methods have the disadvantages for the countries that didn't yet achieve the recuperation of fertility. Nevertheless is important to reinforce that, graphical representations and the indicators of postponement and recuperations can be employed in a variety of circumstances, leading to a more meticulous studying of cohort fertility transformations. Also modelling the postponement transition, using selected social, economic and cultural variables together with the key indicators of postponement process constitutes capable extension of these models.

The postponement of childbearing appears to have a rhythm, the speed of postponement starts slowly, accelerate, and then decelerates as a new equilibrium is reached. Economic and policy changes follow a different "trail". For economics each downturn is eventually followed by an upturn. For policy the problem is to discover the reactions to it are measured and much more research is needed to examine all the aspects of family policies and to separate the policy effect in fertility from other determinants. The dilemma in drawing assumptions about the effect of economic and policy change on fertility is that the timing of these changes may coincide with the moment were fertility start to recuperate. However favourable economic conditions should help in the increasing of fertility and in some countries the increase in fertility can also be explained by specific government policies.

During the past half-century the attentions of researchers and policy communities was focused on fertility decline. By mid 1990s fertility transitions in most of developed countries were in progress or near to the end, and now these issues become less urgent. What will happen next is far from being clear. The future of fertility in countries with levels below replacement is one of the most debated topics in contemporary demography. There is no doubt that fertility has reached historical low levels and will be below replacement in the future. The demographic projections are now directing their attentions to the real cohort once that some of the postponement cohorts are now achieving the end, allow enabling the researcher to have a new panoramic of completed fertility behaviour.

REFERENCES

Becker, G., (1960). "*An economic analysis of fertility.", in* Demographic and Economic Change in Developed Countries. NBER Conference Series 11, pp. 209-231.

Becker, G., (1981). "*A Treatise on the Family*.", Harvard University Press

Bengtsson T., Campbell, C. , Lee, J.Z. (eds.) (2004). "*Life Under Pressure: Mortality and Living Standards in Europe and Asia, 1700-1900*.", Cambridge, Massachusets: MIT Press.

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

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

Bongaarts, J., **Feeney**. G., (2002), “How long do we live?”, in *Population and Development Review,* 28: 13-29

Bongaarts, J., **Feeney**. G., (2003), “Estimating Mean Lifetime”, in Population Council Nº 179.

Bongaarts, J., **Feeney**. G., (2008), “The quantum and tempo of life-cycle events”, in *How Long Do We Live?*, Springer Berlin, Berlin.

Bongaarts, J., **Sobotka**. T., (2010). “Demographic explanations for the recent rise in Europe’s fertility.” Paper presented at the European Population Conference, Vienna, 2 September 2010.

Butz, W.P., and **Ward**, M.P., (1979). “Will US fertility remain low? A new economic interpretation.”, in *Population and Development Review* 5(4): 663-688.

Caldwell, J. C., **Schindlmayr**. T. (2003). “Explanations of the fertility crisis in modern societies: a search for commonalities.”, in Population Studies 57(3): 77-92.

Chesnais, J-C., (1996). “Fertility, family and social policy in contemporary Western Europe”, in *Population and Development Review,* 22(4): 729-739.

Demeny, P., (1986). “Population and the invisible hand”, in *Demography*, 23(4): 473-487.

Demeny, P., (2003). “Population policy dilemmas in Europe at the dawn of the twenty-first century.”, in Population and Development Review 29(1): 1-28.

Dominguez-Folgueras and **Castro-Martin**, (2008).” Women’s changing socioeconomic position and union formation in Spain and Portugal.”, in Demographic Research 19, Article 41.

Esping-Andersen, G. (1999). “Social foundations of postindustrial economies.” Oxford: Oxford University Press.

Esternin, R.A., (1976). “The conflict between aspirations and resources.”, in *Population and Development Review* 2(3-4): 417-425.

Feeney. G., (1983), “Population dynamics based on birth intervals and parity progression.”, in *Population Studies*, Vol. 37, No. 1.

Frejka, T. (2010). “Cohort overlays of evolving childbearing patterns: How postponement and recuperation are reflected in period fertility trends.”, in MPIDR Working paper 2010-026.

Frejka, T., **Calot**. G. (2001). “Cohort reproductive patterns in low fertility countries”, in Population and Development Review 27 (1): 103-132.

Frejka, T., **Sardon**, J.-P. (2004). “Childbearing trends and prospects in low-fertility countries: A cohort analysis.”, in European Studies of Population, Vol. 13, Kluwer Academic Publishers, Dordrecht.

Gauthier, A.H. (2002). “The impact of family policies on fertility in industrialized countries: a review of the literature.”, in Population Research and Policy Review 26.

George, M. V., **Smith**, S.K., **Swanson**, D.A., **Tayman**, F., (2004). “Population Projections”,in The Methods and Materials of Demography, 2nd Edition. San Diego/Amsterdam, Academic Press/Elsevier.

Goldstein, J. R.,(2010). “A Behavioral Gompertz Model for Cohort Fertility Schedules in Low and Moderate Fertility Populations”, in MPIDR Working paper WP 2010-021.

Goldstein, J. R., **Cassidy**,T., (2010). “Cohort Postopnment and period measures”, in MPIDR Working paper WP 2010-015.

Goldstein, J. R., **Sobotka** T., **Jasilioniene** A.(2009). “The end of lowest-low fertility?“, in *Population and Development Review* 35(4): 663-700.

Grant, J., **Hoorens**, S., **Sivadasan**, S., **van het Loo**, M., **DaVanzo**, J., **Hale**, L., et al. (2004). “Low fertility and population ageing. Causes, consequences, and policy options.”, in Santa Monica, CA, USA: Rand Corporation.

Kaneko, R., (2010). “Applying a fertility projection system to period effect analysis: an examination of the recent fertility upturn in Japan”, in Work Sessions on Demographic projections, Lisbon (Portugal).

Kaneko, R., Ishikawa,A., Ishii, F., Sasai, T., Iwasawa, M., Mita, F., Moriizumi, R., (2008). “Population projections for Japan: 2006-2055: outline of results, methods, and assumptions.”, in The Japanese Journal of Population (Tokyo), Vol.6, No.1, pp.76-114.

Kohler, H., **Ortega** J. (2002). “Tempo-adjusted period parity progression measures: assessing the implications of delayed childbearing for cohort fertility in Sweden, the Netherlands and Spain.”, in Demographic research, volume 6, article 7.

Kohler, H., **Billaril** F., **Ortega** J. (2001). “Towards a Theory of Lowest-Low Fertility.”, in MPIDR Working paper WP 2001-032

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

Kohler, H., **Billaril** F., **Ortega** J. (2005), “Low and Lowest-Low Fertility in Europe: Causes, Implications and Policy options”, in F. R. Harris (Ed.), The Baby Bust: Who will do the Work? Who Will Pay the Taxes? Lanham, MD: Rowman & Littlefield Publishers, 48-109.

Kohler, H.-P., **Philipov,** D. (2001). "Variance effects in the Bongaarts-Feeney formula.", in *Demography* 38(1): 1-16.

Lee, R., (1990). "The demographic response to economic crisis in historical and contemporary populations.", in *Population Bulletin of the United Nations* 1990 (29):1-15.

Lee, R., **Mason**, A., (2010). "Fertility, Human capital, and economic growth over the demographic transition", in European Journal of population, 26.

Lesthaeghe, R. (2001). "Postponement and recuperation: Recent fertility trends and forecasts in six Western European countries". Paper presented at the IUSSP Seminar "International perspectives on low fertility: Trends, theories and policies", Tokyo, 21-23 March 2001.

Lesthaeghe, R. (2010). "The unfolding story of the Second Demographic Transition.", in *Population and Development Review* 36(2): 211-251.

Lesthaeghe, R., **Surkyn**., J. (1988). "Cultural dynamics and economic theories of fertility change.", in Population and Development Review 14 (1): 1-45.

Luci, A., **Thévenon**, O., (2010). "Does economic development drive the fertility rebound in OECD countries?", paper presented in EPC (European population conference) in Vienna (Austria).

Lutz W., **Goujon** A., **Doblhammer-Reiter,** G. (1999). "Demographic dimensions in forecasting: Adding education to age and sex." In Frontiers of Population Forecasting, Lutz W, Vaupel J, Ahlburg D (eds). The Population Council: New York 42–58. Supplement to Population and Development Review 24(4).

Lutz W., **Sanderson**, W.C., **Sherbov,** S., (1998). "Experted-Based probabilistic population projections", in Population and Development Review 24, Supplement: Frontiers of Population Forecasting.

Lutz W., **Skirbekk**., V., (2005) "Policies addressing the tempo effect in low-fertility countries.", in *Population and Development Review* 31(4): 699-720.

McDonald, P., (2000). "The "toolbox" of public policies to impact on fertility – a global view.", in Annual Seminar 2000 of the European Observatory on Family Matters, Low Fertility, families and Public Policies, Sevilla (Spain).

Neels, K. (2010). "Economic context and fertility outcomes. Exploring educational differentials in postponement and recuperation of first births in Belgium, France, and the Netherlands" Paper presented at the European Population Conference, Vienna.

Neyer G., Andersson G., (2008). "Consequences of family policies on childbearing behaviour: Effects or Artifacts?", in Population and Development review, Vol.34, Nº4.

Philipov, D. , **Kohler** H-P. (2001). "Tempo effects in the fertility decline in Eastern Europe: Evidence from Bulgaria, the Czech Republic, Hungary, Poland and Russia.", in *European Journal of Population* 17 (1): 37-60.

Prskawetz A., **Fent** Th., **Guest** R. (2008*). "Workforce aging and labor productivity: the role of* *supply and demand for labor in the G7 countries*", in Prskawetz A., Bloom D., Lutz W. (eds), Population Aging, Human Capital, Accumulation and Productivity Growth, Supplment to Population and Development Review, 34:298-324.

Preston, SH. **Heuveline**, P., **Guillot**, M., (2001). Demography: Measuring and Modeling Population Processes, Oxford: Blackwell Publishers Ltd. Ryder

Rodriguez, G., (2006). "Demographic translation and tempo effects: An accelerated failure time perspective.", in Demographic Research 14(6): 85-110.

Ryder, N., (1964). "The process f demographic translation.", in Demography 1.

Oliveira, I., (2007). "A transição da fecundidade e o sistema de respostas múltiplas em Portugal.", in *Análise Social*, 183: 471 - 484.

Sobotka T., (2004), "Is lowest-low fertility in Europe explained by the postponement of childbearing?", in *Population and Development Review,* 30: 195-220.

Sobotka, T., **Skirbekk**., V., **Philipov,** D. (2009). "Economic recession and fertility in the developed world: A literature review", research note produced for the European Commission (Demography Network of the European Observatory on the Social Situation and Demography).

Sobotka, T., **Zeman** K., **Lesthaeghe** R., **Frejka** T., (2010). "Postponement and recuperation in cohort fertility: New methods and their application to European countries and the United States." Forthcoming in *European Demographic Research Papers*, Vienna: Vienna Institute of Demography.

van de Kaa, Dirk J., (2002)."The Idea of a Second Demographic Transition in Industrialized Countries.", in *Sixth Welfare Policy Seminar*, Tokyo: National Institute of Population and Social security.

van de Kaa, Dirk J., (2008). "Demographic Transitions.", in working paper nº 2008/1 in Netherlands Interdisciplinary Demographic Institute (NIDI).

Vitali, A., **Billari**, F.C., **Prskawetz**, A., and **Testa**, M.R., (2009). "Preference theory and low fertility: A comparative perspective". *European Journal of Population* 25(4): 413-438.

Zeng Yi ,**Land**, K. C. (2002). "Adjusting period tempo changes with an extension of Ryder's basic translation equation.", in Demography, 39(2):269–285.