

TEMPO EFFECTS ON PERIOD FERTILITY IN TURKEY: A STUDY FROM TURKEY DEMOGRAPHIC AND HEALTH SURVEYS

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Turkey has been experiencing significant fertility decline since the 1950s. Increasing mean ages at childbearing have accompanied this decline, thus studies regarding tempo effects are necessary for Turkey. The main aim of this study is to reveal the tempo distortions in recent period fertility in Turkey as a whole and for different sub-groups by using an adjustment procedure. A procedure by Bongaarts and Feeney corrects period TFR for tempo distortions, using changes in mean ages at childbearing by birth order. The adjusted TFR reflects the level of fertility that would have been observed in the absence of changes in timing. Since vital registration system in Turkey does not provide necessary data for the method, the study employs data from two successive demographic surveys, TDHS-1998 and TDHS-2003. Findings show the existence of tempo distortions in period fertility in Turkey. Tempo distortions appear to be higher for women in higher fertility areas.

INTRODUCTION

The total fertility rate (TFR) is the sum of age specific fertility rates, calculated by births in a year from a certain age group of women divided by the number of women in that age group. A “synthetic cohort” approach is employed in the calculation of the period TFR, collecting information from different cohorts of women and combining them to form a single indicator. The TFR shows the average number of live births a woman would give by the end of her reproductive period, assuming she experiences the current age-specific fertility rates and survives until the end of her reproductive period. This indicator is a quantum measure that is subject to tempo distortions. A tempo distortion is defined as an undesirable inflation or deflation of a period quantum or tempo indicator of a life-cycle event that results from a rise or fall in the mean age at which the event occurs (Bongaarts and Feeney, 2005). The tempo distortion in the TFR is caused by the changes in the mean ages of childbearing. As women delay their childbearing, the number of births per unit time diminish, causing a decrease in TFR. Thus, different TFRs can be obtained for the same number of births per woman, but with different timing of births. Therefore, keeping all other factors constant, if the mean age at childbearing increases and the number of births women give remain the same, TFR will still imply that women have less and less children, creating a delusion.

Due to tempo effects, the use of TFR may not be very representative of the real level of fertility women are performing. This is the main topic of attention in this paper. According to the Turkey Demographic and Health Surveys (TDHS), TFR has decreased from 2.65 in 1993 to 2.23 in 2003 (HUIPS, 1994; HUIPS, 2004). The mean age at childbearing (MAC), on the other hand, has increased from 26.70 to 27.16 in the same period. This suggests that MAC has a share in the TFR decline. Therefore Turkey might be experiencing higher fertility than indicated by TFR.

Another focus of this study is regional differentiations of tempo effects. Traditionally, all national demographic surveys in Turkey have provided estimates for urban and rural places of residences, and for the five main regions of Turkey. Rural fertility is known to be higher than urban fertility; and the Western Anatolia and Eastern Anatolia regions are the two ends of the spectrum in Turkey. The Western region has the lowest fertility rates, and the opposite holds for the Eastern

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region. Thus women living in different parts of Turkey can be regarded as being at different stages of the demographic transition process. The differences in tempo effects may provide clues on which sub-groups of women in Turkey postpone fertility more.

This study has several contributions to the literature. Firstly, tempo effects have not been studied extensively in Turkey so far. Although literature will recognize increasing ages at marriage and births, this study is the first attempt to quantify its effects on the total fertility rate. Secondly, empirical applications of the methods are mostly on European countries with reliable vital registration systems that enable annual analysis with respect to single ages. This study stands as an example on survey data in a non-European setting, and total fertility rates are usually calculated based on longer durations. Finally, tempo effects are often calculated for countries as a whole, rather than different sub-groups; this paper includes findings on both.

BACKGROUND

Although fertility decline is a known phenomenon in Turkey since the 19th century (Behar, 1995), the demographic transition of Turkey is generally reckoned to begin around the foundation of the Republic (SIS, 1995). The first stage was from 1920s to the 1950s, with declining mortality and high fertility. The second stage has been marked by an irreversible decline in fertility, lasting until the 1980s. From this decade on, Turkey is considered to be at the last stage of the demographic transition, with low, converging birth and death rates.

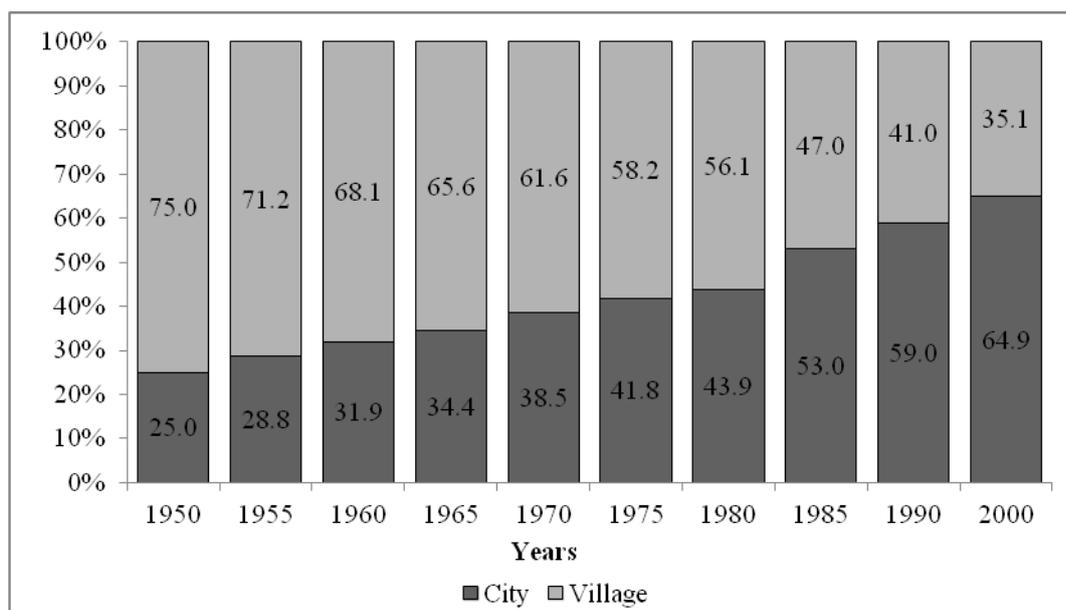
Total fertility rate has decreased from more than 6 children per woman to below 3 in the late 1980s. By 2003, the total fertility rate has reached 2.23 (HUIPS, 2004). Urban-rural and regional differences have prevailed within the demographic transition. The TDHS-2003 has indicated a TFR of 2.65 for rural, and 2.06 for urban areas. Fertility is lowest in the West Anatolia region, and highest in the East Anatolia region; with three-year TFRs of 1.88 and 3.65 respectively, according to the TDHS-2003. The other regions usually portray fertility levels in between these two extremes, but closer to the West region. The findings from TDHS-2003 are 2.3, 1.86 and 1.94 for the South, Central and North Anatolian regions respectively.

Table 1. Age-Specific Fertility Rates, Turkey, 1978-2003

	1978	1988	1993	1998	2003
15-19	93	45	56	60	46
20-24	259	193	179	163	136
25-29	218	183	151	150	134
30-34	154	102	94	93	78
35-39	101	55	38	42	38
40-44	38	19	12	13	12
45-49	2	7	0	1	2

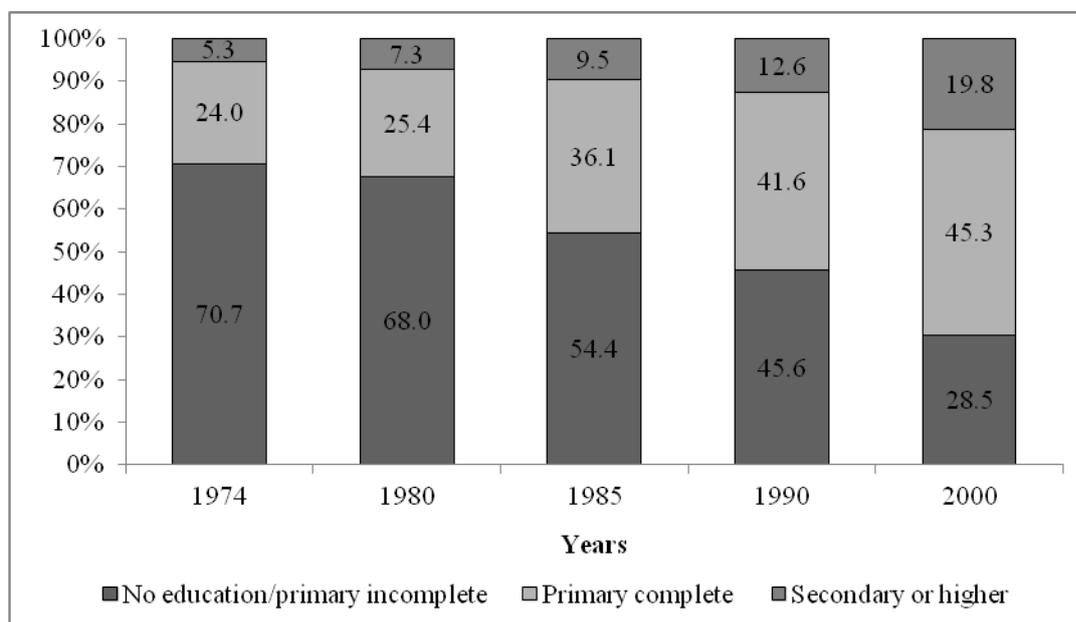
Source: HUIPS (2005)

Not only has the level of fertility has changed in time, but also its pattern (Table 1). While age specific fertility rates peaked at the 20-24 age group in 1978, it is shared between the age groups of 20-24 and 25-29 according to TDHS-2003. Furthermore, the share of births towards older ages of the reproductive period has decreased in time.

Figure 1. The Changes in City and Village Percents, Turkey, 1950-2000*

Source: SIS (2003)

*The definitions of SIS for city and village are based on administrative units. They are different from the rural and urban definitions of HUIPS, used in TDHSs.

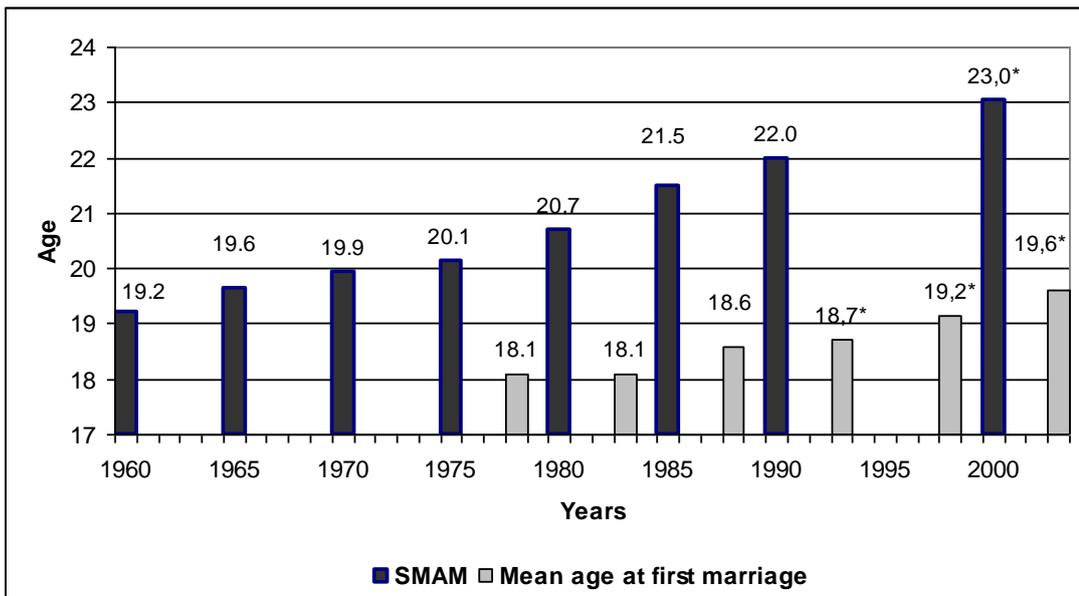
Figure 2. Distribution of women aged 25 and over by educational level, Turkey, 1975-2000

Source: SIS (2003)

The changes in the pattern of fertility provide evidence for a change in the timing of fertility in Turkey. Many social changes in favour of lower fertility have taken place within the demographic transition, such as urbanization and increasing enrolment in formal education (Figure 1, Figure 2). The proportion of population living in cities has reached 50 percent in early 1980s, and has reached to 65 percent as of 2000. Meanwhile, the proportion of women who have no formal education, or have not completed primary school has decreased dramatically in the last three decades. Along with other social changes, these have resulted in higher ages at marriage for women (Figure 3), which is known to be closely related to age at first birth in Turkey. Behar (1995)

mentions that the mean ages at first marriage were high in İstanbul in the late 1930s, and that the changes in nuptiality rates were as responsible as the decline in marital fertility in the fall of TFR. Besides, the spread and availability of contraception has served to lengthening birth intervals. In the light of all these, mean ages at childbearing are expected to be on the rise for births of all orders in time.

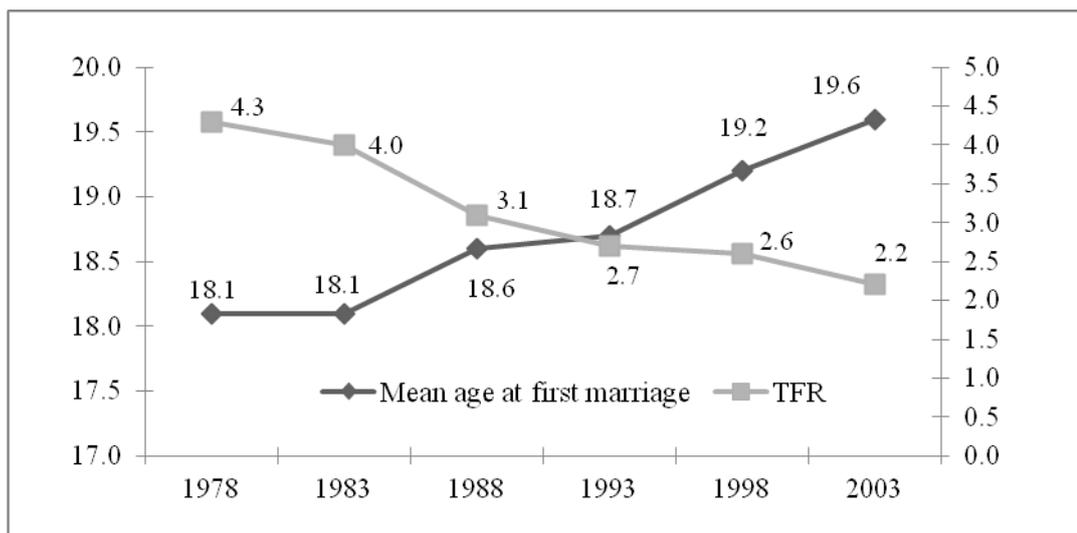
Figure 3. Mean Age at First Marriage and Singulate Mean Age at first Marriage (SMAM), Turkey, 1960-1990



Source: SIS (1995); HUIPS (1987; 1989)

*Own calculations of author.

Figure 4. Changes in Total Fertility Rate and Mean Age at Childbearing, Turkey, 1978-2003



Source: HUIPS (1980; 1987; 1989; 1994; 1999; 2004)

Figure 4 shows the changes in mean age at childbearing together with the total fertility rate. The inverse relationship is clear for Turkey. Based on the discussion so far, this paper aims to examine the level and timing of fertility in Turkey to find out if tempo effects matter. This examination will be made in the breakdown of urban and rural residences and the five main

demographic regions of the country, which will provide further insight to whether the level of fertility matters in the changes in fertility timing.

DATA AND METHODS

Data

This study uses data from two consecutive national demographic surveys: TDHS-1998 and TDHS-2003. Both are carried out by the Hacettepe University Institute of Population Studies: which has been carrying out regular quinquennial surveys on demography and health since 1968. The surveys implemented in 1993, 1998 and 2003 were completed as a part of the international Demographic and Health Surveys program. The Turkey Demographic and Health Surveys are nationally representative surveys on major demographic issues such as fertility, child and infant mortality and family planning.

The Turkey Demographic and Health Surveys (TDHS) have complex sample designs: A weighted, multistage and stratified cluster sampling approach is employed in the sampling design. TDHS-1998 and TDHS-2003 have two types of questionnaires in common: A household questionnaire and a woman's questionnaire. The data used for the study is obtained from the birth history sections of the women's questionnaires.

Table 2 summarizes the number of interviews carried out in TDHS-1998 and TDHS-2003. Despite the large samples of both surveys, it should be noted that the allocation of the sample size is not equal between regions; for which estimates are given in this study. The North region has less than 1000 interviews of women in both surveys, which is under the recommendation of the DHS Program for geographical regions (Macro Int., 1996). All remaining regions have more than this number of interviews in both surveys.

Table 2. Summary of the questionnaire types and number of interviews in the TDHS

Survey	Types of Questionnaires Used and Number of Interviews			
	Household	Ever-Married Women	Never-Married Women	Husband
1998	8059	6152	2424	1971
2003	10863	8075	4208*	NA**

Source: HUIPS (1999; 2004)

*The number of women interviewed using the never-married women module of TDHS-2003 household members data set.

** Not available

The calculation of the total fertility rate is based on all women rather than ever-married women. This results in the use of a factor for the denominators of the total fertility rates for TDHS-2003, where women's data set is based on ever-married women only. These factors are called all-women-factors*, and are calculated separately for urban-rural residences and five regions. They are not necessary in TDHS-1998, since all women regardless of marital status were interviewed.

* The calculation of the all women factors can be found at:
http://www.measuredhs.com/help/Datasets/All_Women_Factors.htm

Method

The analytical method used in this paper is proposed by Bongaarts and Feeney (1998). Work by Hajnal (1947) and Ryder (1956; 1959; 1964; 1980;1983) are often referred to as the background to Bongaarts and Feeney's work. The method, generally referred to as the B-F adjustment, aims to adjust the conventional TFR by using information on changes in mean age at childbearing to calculate an adjusted TFR that represents the "level of period fertility in the absence of changes in the timing of fertility", meaning the quantum of period fertility. The difference between the conventional and adjusted rates gives the tempo effect.

The basic idea of the B-F adjustment is that a change in the mean age at childbearing changes the number of births per unit time, despite the fact that the number of children that will eventually be born remains the same. Three basic conclusions arise regarding the issue: (1) Tempo distortions of period fertility occur during periods when the mean age at birth of a given order changes. (2) The size of the tempo distortion in a given TFR component depends on the annual change in the mean age of fertility at the corresponding birth order. (3) Tempo distortions have to be analyzed separately for each birth order (Bongaarts, 1999).

A closer look at the calculation of the mean age of childbearing reveals the need for using the adjustment for birth order specific TFRs. In its conventional form, this indicator can be expressed as a weighted average of mean age at childbearing for births of each order (Bongaarts and Feeney, 1998). To demonstrate:

$$MAC = MAC_1 w_1 + MAC_2 w_2 + MAC_3 w_3 + MAC_{4+} w_{4+} \quad \text{where } w_i = \frac{TFR_i}{TFR}$$

If higher order births decline more rapidly compared to lower order births, then the weights of higher order births decline as well, reducing the share of ages at higher birth orders, thus reducing the overall mean age at childbearing. This implies that even if mean ages of separate birth orders increase, the overall mean age may still decrease if there are decreases in higher order births. Thus using an overall mean age at childbearing rather than order-specific ones may be misleading.

The calculation of the quantum and tempo of TFR as suggested by Bongaarts and Feeney (2005) is a rather simple procedure. After defining a period on which the adjustment is required, the mean ages at childbearing for the beginning and end of this period are calculated. Their difference divided by the length of period in years gives the annual change in mean age at childbearing.

Let the mean age at childbearing be x .

$$\frac{x_t - x_{t+a}}{a} = r$$

where r is the annual change in the mean age at childbearing. Then where r is the annual change in the mean age at childbearing. Then,

$$AdjTFR = \frac{TFR}{(1-r)} \quad \text{Where } AdjTFR \text{ is tempo adjusted TFR value.}$$

As a result, Bongaarts and Feeney give the following formula, the full derivation of which can be found in Bongaarts and Feeney (1998):

$$AdjTFR_i = \frac{TFR_i}{(1 - r_i)}$$

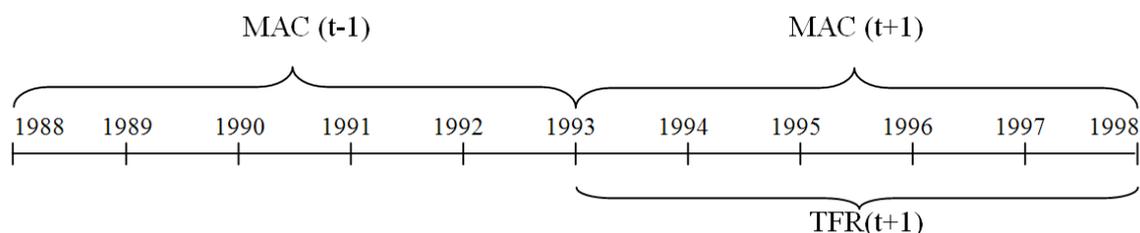
Where $i = 1,2,3...$ as birth orders.

$$\text{Thus } AdjTFR = \sum AdjTFR_i$$

The assumption of this model is that tempo changes are the same for births occurring at any age. To clarify, women of all ages and cohorts that give birth in year t postpone or advance their births to the same extent, the shifts are period-specific. By making this assumption, the model suggests that the shape of the fertility schedule remains the same, it only changes location.

Although the birth history sections in TDHSs provide data to obtain annual estimates, five-year TFRs are preferred to ensure the stability of estimates. The adjustment formula requires the MAC values of both the beginning and the end of the period for which TFR is to be adjusted. Such data is not always available, therefore literature has examples of different utilizations of time periods. This study uses an approach by Lesthaeghe and Willems (1999) for selecting the time periods to be used for the adjustment. Lesthaeghe and Willems (1999) have used the difference in mean ages at childbearing of two successive periods, and have used it to adjust the TFR of the latter period. The application of this approach makes it possible to adjust the TFR values of 1998 and 2003, using data from the TDHS-1998 and TDHS-2003.

Figure 5. The time periods used for the adjustment of TFR adopted to TDHS-1998



The utilization of time periods for TDHS-1998 is given in Figure 5. Birth history data allows the calculation of TFRs 0-4 years preceding the survey as well as 5-9 years preceding survey data. Thus the last ten years of the birth history of TDHS-1998 is used in the adjustment procedure of this survey to produce two five-year TFRs. The same approach is used for TDHS-2003.

RESULTS

According to the findings, the five year total fertility rates have decreased from 2.62 to 2.35 between TDHS-1998 and TDHS-2003 (Table 3). In the mean time, the mean age at childbearing has increased from 26.77 to 27.04. This increase in the mean age at marriage has been reflected as negative tempo effects on TFRs: -0.32 for TDHS-1998 and -0.21 for TDHS-2003. There does not seem to be a regularity of tempo effects by birth order: The birth order most affected by tempo distortions is the second one in TDHS-1998, and fourth one in TDHS-2003.

Table 3. Birth order specific B-F adjustments for TFR, TDHS-1998 and TDHS-2003

Birth order	1998				2003			
	TFR	AdjTFR	Tempo effect	MAC	TFR	AdjTFR	Tempo effect	MAC
1	0.82	0.90	-0.08	22.87	0.73	0.76	-0.03	22.99
2	0.71	0.83	-0.12	25.63	0.63	0.69	-0.06	25.97
3	0.41	0.46	-0.05	27.66	0.39	0.45	-0.06	28.53
4	0.23	0.29	-0.07	29.33	0.21	0.27	-0.07	30.12
5	0.13	0.13	-	30.39	0.12	0.12	-	30.83
6	0.10	0.10	-	32.62	0.08	0.08	-	31.67
7	0.07	0.07	-	33.03	0.06	0.06	-	32.56
8+	0.16	0.16	-	36.83	0.13	0.13	-	36.44
TFR	2.62	2.93	-0.32	26.77	2.35	2.56	-0.21	27.04

Fertility is higher in rural areas compared to urban areas in Turkey. Urban fertility has declined from 2.39 to 2.15 and rural fertility from 3.12 to 2.84 between 1998 and 2003 respectively. Findings by type of place of residence show that tempo effects are larger in rural areas (Table 4). It is more than double than that of urban areas in TDHS-1998, and slightly above in TDHS-2003.

The total fertility rate has declined in all regions between the two surveys. The highest tempo effects have been calculated for the East and South regions overall, which have the highest fertility levels. After being adjusted for tempo effects, the TFR in the Eastern region increased from 4.32 to 5.03 in TDHS-1998, and from 3.85 to 4.22 in TDHS-2003. The adjustment increases the TFR of the Southern region by 0.6 in both surveys. The North region seems to show an irregularity; by showing an over-average negative tempo effect in TDHS-1998, followed by a small and positive one in TDHS-2003. There is no apparent reason to think that the North region has a special case in terms of fertility postponement; it is quite likely that the calculated tempo effect is sensitive to sample size.

Table 4. B-F adjustments for TFR by type of place of residence and region, TDHS-1998 and TDHS-2003

	1998			2003		
	TFR	AdjTFR	Tempo effect	TFR	AdjTFR	Tempo effect
Urban	2.39	2.65	-0.26	2.15	2.36	-0.21
Rural	3.12	3.73	-0.61	2.84	3.09	-0.25
West	2.01	2.19	-0.18	1.93	2.19	-0.26
South	2.59	3.21	-0.62	2.36	2.99	-0.63
Central	2.56	2.90	-0.34	2.10	2.22	-0.12
North	2.66	3.11	-0.45	2.02	2.00	0.02
East	4.32	5.03	-0.71	3.85	4.22	-0.37
Turkey	2.62	2.93	-0.31	2.35	2.56	-0.21

DISCUSSION AND CONCLUSION

Descriptive results for Turkey have revealed that order specific mean ages at childbearing have generally increased with respect to survey date, resulting in negative tempo effects in general. The presence of negative tempo effects on the total fertility rate supports the hypothesis that this indicator is actually being affected by the shifts in childbearing in Turkey, and the quantum of fertility is higher than we can observe by using this period indicator.

The levels for overall tempo effects for TDHS-1998 and TDHS-2003 are -0.31 and -0.21 respectively. Empirical findings regarding the magnitude of tempo effects vary in the literature. Sobotka (2004) has calculated tempo effects in a range of -0.17 (Western Europe) to -0.36 (Southern Europe) for different parts of Europe (Western, Northern, Southern, Central, Baltic Countries, South-eastern and Eastern). Southern Europe has the lowest TFR among all other, but the highest magnitude of tempo effect. The reverse holds in Turkey: The highest fertility regions (East and South) have the highest tempo effects; and rural areas have larger tempo effects than urban areas. Despite looking contradictory, this finding makes sense considering the potentially different rationales in postponing childbearing in Europe and Turkey.

Postponement of childbearing in Europe is generally discussed within lowest-low fertility and the second demographic transition. Rising individuality, co-habitation and divorce, along with high levels of education and high levels of participation of women in the labour force as often attributed to the low fertility levels and large postponements of childbearing in Europe. From this perspective, delays in childbearing should be expected of women whose fertility is low already.

On the other hand, this does not seem to be the case in Turkey. The five-year total fertility rates are above replacement level in all regions, suggesting that the classical demographic transition has not been completed. As of 2000, only 40 percent of women are participating in the labor force, 76 percent of which work in the agricultural sector (SIS, 2003). Thirty percent of women have either no formal education or have not completed primary school (SIS, 2003). Fertility decline takes place in all regions, and the high fertility regions are also those experiencing relatively more rapid fertility declines. Rises in mean age at childbearing should also be more rapid in these regions, parallel to fertility declines, and this can explain the higher tempo effects calculated for these regions.

Lesthaeghe and Willems (1999) suggest in their study that it is likely for increases in female education and employment to slow down in Europe, reaching levels of saturation. According to them, this may bring a halt to postponement of childbearing. However, although levels of female education and employment are high in developed countries, fertility postponement still exists, and this is usually explained with cultural theories or the second demographic transition theory. For Turkey, the labour force participation of women is currently decreasing, and is expected follow a U-shaped curve (TÜSİAD, 1999). Thus, potential increases of ages at childbearing in the near future are more likely to be related to female education than employment. If female labour force participation rates start increasing, and fertility keeps decreasing after reaching replacement level, the European arguments may gain validity for Turkey.

Since findings are reasonable, it can be concluded that the application of the adjustment procedure is feasible on survey data for Turkey. The adjustments in the literature are usually based on annual estimates obtained from vital registration data. The lack of this data source prohibits annual calculations for Turkey. Choosing short time periods for the calculation of TFR results in

case numbers that are small, causing higher standard errors for estimates, which have not been examined in this study.

Despite concluding that the B-F adjustment is plausible, work by Adalı (2007) shows that the tempo effects found are sensitive to time periods chosen for the adjustment of the TFR. It is also sensitive to data sources used; for the same time periods as this paper, she has used two surveys in the adjustment process of a single TFR; and has obtained tempo effects of -0.21 and -0.19 for TDHS-1998 and TDHS-2008 respectively.

Having found non-zero tempo effects, this paper has shown that an additional measure for period fertility is needed for Turkey to reflect the real quantum of period fertility. Displaying the adjusted TFR together with the conventional TFR may bring a new dimension to evaluators of this rate, showing the level that would have been observed in the absence of changes in timing.

Although literature focuses widely on tempo effects in developed countries and briefly on developing countries, attention to tempo effects in developing countries is also necessary. Changes in social indicators as education and labour force participation, increasing ages at marriage and increasing contraceptive use are common phenomena in developing countries that are related to postponement of childbearing. Thus related studies should cover developing countries as well.

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ÖZET

TÜRKİYE'DE DÖNEMSEL DOĞURGANLIK ÜZERİNDEKİ ZAMANLAMA ETKİLERİ: TÜRKİYE NÜFUS VE SAĞLIK ARAŞTIRMALARI'NDAN BİR ÇALIŞMA

Türkiye'de doğurganlık 1950'li yıllardan beri ciddi bir şekilde düşmektedir. Bu düşüşle birlikte ortalama çocuk doğurma yaşlarında artışlar da görülmüştür. Bu nedenle Türkiye'de doğurganlık göstergeleri üzerinde zamanlama etkilerine ilişkin çalışmalara ihtiyaç vardır. Bu çalışmanın temel amacı Türkiye'de yakın dönemdeki toplam doğurganlık hızlarındaki zamanlama etkilerini ortaya çıkartmaktır. Bu işlem hem Türkiye geneli için, hem de nüfusun çeşitli alt-grupları için yapılmıştır. Kullanılan düzeltme işlemi Bongaarts ve Feeney tarafından geliştirilmiştir. Bu yöntem doğum sırasına göre toplam doğurganlık hızını, ortalama çocuk doğurma yaşlarındaki değişimi kullanarak düzeltmektedir. Düzeltilmiş TDH, doğurganlığın zamanlamasındaki değişimlerin yokluğunda gözlemlenecek olan doğurganlık düzeyini işaret eder. Hayati kayıt sistemlerinden bu yöntem için gerekli bilgiler temin edilemediği için iki tane demografik araştırmanın verileri kullanılmıştır: TNSA-1998 ve TNSA-2003. Bulgular Türkiye'de dönemsel doğurganlık göstergelerinde zamanlama etkilerinin olduğunu göstermiştir. Bu etkilerin yüksek doğurganlık görülen bölgelerde daha yüksek olduğu gözlenmiştir.