

WORKING PAPER

MEASURING FERTILITY RESPONSES TO POLICY MEASURES IN THE GERMAN DEMOCRATIC REPUBLIC

*Thomas Büttner
Wolfgang Lutz*

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Foreword

Everywhere the advent of industrial society and correspondingly high incomes has been accompanied by a fall in births. If one could only explain the fall unambiguously policy measures to counter it could be readily devised. Unfortunately there are many explanations, and from each follows a different policy prescription.

If the income derived from women's work in offices and industry has become so high that they cannot afford the time to have children, then payments from the State to cover what they lose through child raising will offset that. If the obstacle is the cost of clothing and educating children to present high standards, then family allowances will serve and be much less expensive than replacing women's salaries. But if the reason for couples holding back is the danger of divorce, where the children would be a handicap to the single parent for work and for remarriage, then state subsidy is not so obviously the answer. And if the obstacle to child-bearing is a shift in the culture from a familistic to an individual orientation then perhaps no affordable amount of money will induce people to have children.

One could go on this way. If parents do not have children because they cannot find living premises sufficiently large for them, then housing subsidies are the answer. Some "explanations" of the fall in fertility lead to simple policy solutions; others would seem not to be amenable to any kind of policy. The inability to distinguish among competing theories of the fall of fertility means that theory cannot by itself prescribe policy. To get around the inability to understand theoretically we have resort to data.

The present paper presents empirical evidence that in fact policy can make a difference. In order to do that it had first to measure the difference between fertility in West Germany and Austria on the one hand and East Germany on the other. Statistics show clearly that year by year since 1976 when policy measures were introduced in East Germany births have been higher by about half a child each year. But suppose that was due to parents just having earlier whatever number of children they were to have anyway; if this were so the rise in annual rates would be only temporary, and would have only a trifling long term effect. Büttner and Lutz establish that the rise in the East German rate is not of this character. And they also show that such a rise did not occur in West Germany and Austria.

The measures that produced the rise included generous maternity leave, plus subsequent paid leave for working mothers, interest free marriage loans whose repayment was partly canceled on the birth or children. By concentrating on third and later children some of the benefits would have more effect on fertility for a given total expenditure.

Unfortunately neither the East German authorities nor Büttner and Lutz were able to distinguish the effect of the various elements in a somewhat heterogeneous package of policy measures, but they do show unambiguously the effect of the package as a whole.

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MEASURING FERTILITY RESPONSES TO POLICY MEASURES IN THE GERMAN DEMOCRATIC REPUBLIC

Thomas Büttner and Wolfgang Lutz

1. Introduction

In a recent UN survey of government views on population in 39 countries of the ECE-Region (Europe and North America), 13 countries explicitly stated that they feel their current fertility levels are too low (United Nations 1988). Ten of these countries state they have implemented policies intended to raise the level of fertility. Among the remaining countries that did not explicitly state a dissatisfaction with fertility levels still nine governments intend to intervene to maintain current levels and prevent fertility from declining further.

Obviously, fertility levels that are well below replacement for sustained periods result in a number of problems of which the policy makers become increasingly aware. Essentially national governments have only two choices:

1. Let the level of fertility go its own way without any interference. In this view existing family support is seen as social policy rather than population policy. As concerning the age-structural consequences of low fertility one hopes to be able to solve the problems by restructuring when they become urgent.
2. Try to build an incentive structure that makes it more attractive for young couples to have children and therefore results in a higher level of fertility. Such measures could range from direct or indirect financial benefits (transfer payments, tax reductions, possibly even a consideration of children for the pension benefits), legal protection (e.g. extended maternity leave), to improvements in infrastructure (day care, housing) and even attempts to make the general cultural environment more friendly to children.

In reality, even countries with an explicit population policy must to some extent rely on the first strategy because of the great uncertainty about the effect of pronatalist measures on the level of fertility. In this respect scientific analysis has been quite unsuccessful in providing policy makers with a sound basis for decisions. Even crude methods to quantitatively estimate the effect are ambiguous. Several attempts have been made to show effects of pronatalistic policies (Koubek 1984,1985; Bodrova 1985; Andorka and Vukovich 1985; Klinger 1985,1987; Chesnais 1985; Höhn and Schubnell 1986; Calot 1988), but most analyses failed to identify measurable effects on the level of fertility.

Generally, one can attempt to study the effectiveness of policies intended to increase fertility levels under two different approaches:

1. An approach based on time series analysis that relates trends in total fertility to the timing of policy measures. If fertility increases after a new measure has been introduced the policy is regarded as successful. Under this crude approach, however there is no way to measure the "real" effect of a policy because we do not know how fertili-

ty would have behaved without the policy. It might have declined or it might have increased even stronger. There is no *tertium comparationis* for an evaluation of the effect.

2. Another more sophisticated approach would be the use of econometric modelling to estimate on the basis of empirical data the dependence of fertility levels on various financial family benefits. The estimated elasticities could then indicate the effects on the level of fertility of changes in the extent of benefits. But again such an approach—especially when it is based on period fertility—can only under very strong assumptions estimate what fertility levels would have been without the financial benefits. It also disregards non-material factors that seem to play a decisive role in determining fertility trends and differentials. Why is the total fertility rate in the United States without any legal maternity leave or direct child benefits still higher than that in most Western European countries with very elaborate and extremely expensive family support schemes? An incorporation of non-economic variables into such a model might be worth the effort.

In this research note we propose a model that is based on the time-series approach and tries to find the missing standard for comparison through the means of Age-Period-Cohort (APC) analysis. Hence we do not attempt to estimate an elasticity of certain financial inputs but take the population policy package of 1976 with all its financial and non-material impacts as a cutting point in time and see how the period effects react to it.

2. Goals of the GDR Population Policy

The German Democratic Republic (GDR) attempts to conduct an active population policy. Already since 1950 certain population policy measures and related legislative changes were carried out, but not before 1971 an active and concentrated effort in population policy had been made.

In the GDR population policy is considered as an integral part of the general social policy. The latter is composed of "a complexity of measures and methods ... which form social relationships" (Winkler 1987, pp. 347-348). Social policy is therefore a policy influencing all aspects of "the rising of the standard of living of social classes, strata, and groups and the development (German: *Ausprägung*) of a socialist way of living" (Winkler 1987).

As a part of social policy the population policy (according to Speigner 1987, pp. 143-174) serves to promote a correspondence between socio-economic developmental goals and demographic structures for the benefit of the individuals and the interests of the society as a whole. Such an orientation, however, cannot be restricted to population policy in a narrow sense. It also applies to policies which includes different aspects related to population development, as for instance health, family, housing policy, etc. Within the context of population related policy measures, the following principles of policies relevant to fertility can be identified for the GDR:

1. Population policy is oriented on needs and promotive of births (German: *Bevölkerungspolitik ist bedürfnisorientiert und geburtenfördernd*) (Speigner and Winkler 1988, p. 50). The most important aim of population policy is to enable young people to have as many children as they would like to have. In the context of complete sovereignty of individuals and families to decide whether or not to give birth to (another) child, population policy has to consider the individual's desire for children and their specific needs as a starting point.

Sociological investigations in the GDR (Speigner 1987, pp. 98-115) showed the following structure of needs and desires relevant to fertility:

- the desire to have a professional career with a related professional esteem
- the desire to have children;
- the desire to live in an intimate relationship (family);
- the need to have an appropriate standard of living.

This combination of basic needs and desires requires a population policy which enables a woman (in correspondence with her partners) to fulfill her childbearing desire and, at the same time, participate in economic activities and continue her career.

2. Considering the above-stated principles, the GDR population policy quantitatively aims at attaining the replacement level of reproduction (GDR 1988, p. 10). With a current fertility level that is about 80–85% of the replacement level the population policy is fertility-promoting. There is no doubt, however, that the attainment of replacement fertility can only be reached in the long run.

3. Observed Fertility Trends and Policy Measures

Over the past 40 years the total number of live births in the GDR fluctuated from a high of 310,800 in 1951 to 271,400 in 1958, back to 301,500 in 1963, reaching a minimum of 179,100 in 1974, and recovering to 245,100 in 1980. In 1987 226,000 live births were registered.

Figure 1 plots the trends in the Total Fertility Rate (TFR) from 1964 to 1987. We see first a steady decline from the peak of 1965 until 1971 when period fertility suddenly drops by more than half a child on the average. After 1975 fertility again recovers to slightly under replacement level. Since 1980 a slowly declining trend appears.

It is obvious that the strong fluctuations in the 1970s are closely related with social and population policy measures introduced by the government in 1972 and 1976. In March 1972 a package of measures was introduced that among other things brought a legislative change allowing the interruption of pregnancies up to the twelfth week after conception. Although a full range of contraceptive means was already available the access to this "ultimate mean of family planning" changed the fertility behavior completely in a way that through avoiding unwanted births the individual's desire for children now became the sole determinant of fertility (at least concerning excess fertility). Although this measure was not the only one issued in 1972, it determined the fertility trend significantly. Other measures introduced as of 1 July 1972 were:

- Introduction of a special financial support for young married couples. They were entitled to purpose-tied, interest-free loans in case of their first marriage and until an age limit of 26 years for both partners. After the births of children within a given period the amount to be repaid is reduced.
- Prolongation of paid maternity leave from 14 to 18 weeks.

In May 1976 another special set of population policy measures was introduced including among others:

- Prolongation of maternity leave from 18 to 26 weeks (6 weeks before and 20 weeks after delivery). During this leave women are entitled to a maternity benefit amounting to their latest average net income; payments are made by the State Social Insurance.
- Introduction of a paid leave for all working mothers with two or more children after maternity leave until the child's first birthday (the so-called "baby year"). During this time a payment is provided that equals the regular sick pay, but with a lower limit at 300 German Marks per month.

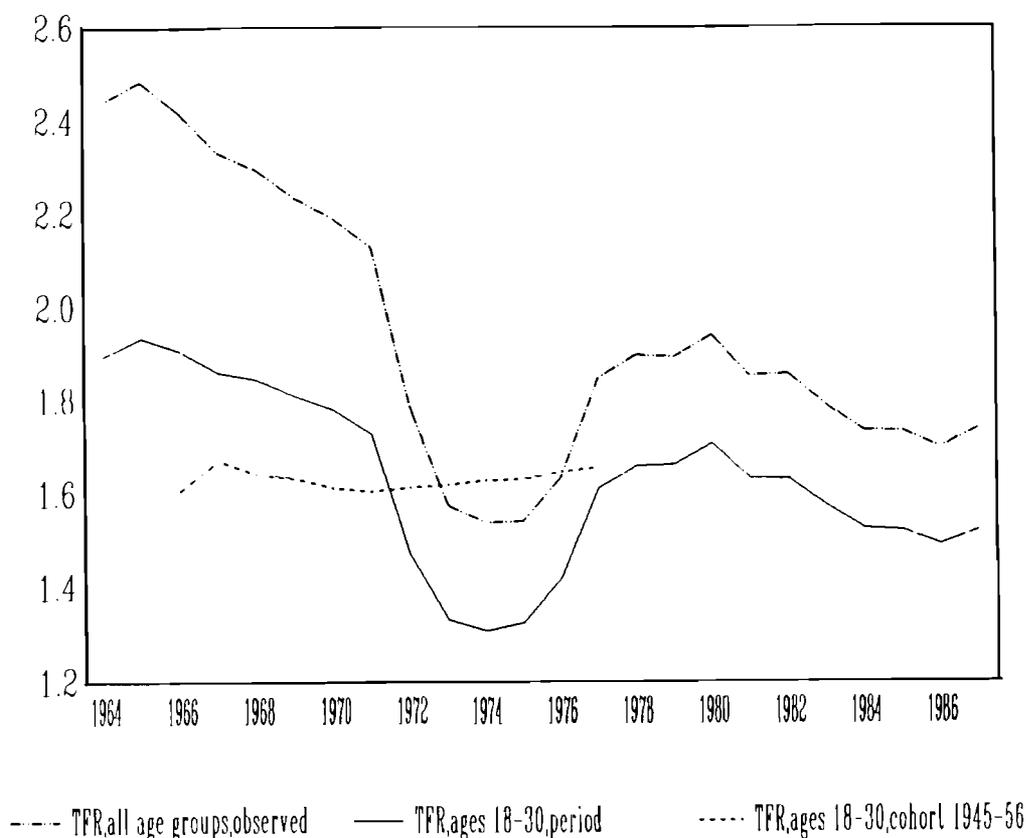


Figure 1. Fertility trend 1964–1987; period and cohort fertility.

Psychologically this package received great attention and was considered a major improvement for mothers. A crude comparison to the curve of fertility trends indicates that period fertility rates seem to have responded quite strongly to the introduction of this package.¹

The second curve in Figure 1 pertaining only to women aged 18 to 30 shows that the fluctuations after 1970 were predominantly due to this age group since the curve runs by and large parallel to that of the total fertility rate considering all ages. Before 1970 the normal TFR declines stronger because of significant declines in the age groups beyond age 30. The fertility of the restricted age range 18–30 is considered here because it will be used in the model below.

Figure 1 also gives the trend in the total fertility rate of cohorts (also restricted to ages 18–30). In the graph the curve is shifted by 21 years, roughly the mean age at births in the GDR over that period. Despite the strong period fluctuations we observe very little change for the cohorts for which we have data to cover the complete age range 18–30. This gives us a first indication that the strong period fertility fluctuations associated with the policy measures hardly affected cohort fertility.

¹See Vortmann (1978) who inspected the births by month around 1976 and found strong response to the measures at the very first time it was possible to react.

4. Specifying an Age-Period-Cohort Model

In this paper we will attempt to measure the effect of the 1976 package of pronatalistic policy measures on the level of fertility. As mentioned above we will use a time-series approach and try to generate a basis for comparison (*tertium comparationis*) by simultaneously estimating the effects of age, cohort, and period on the given set of age-specific fertility rates over the period 1964 to 1987. In order to capture more complete cohorts we restrict the analysis to the most important age group 18-30. In the GDR more than 80% of all children are born within this age range.

The logic behind this approach is the following: In a multiplicative model coefficients for three sets of dummy variables (one for birth cohorts, one for single years of age, and one for the periods specified) are estimated to fit best to the observed time series of age-specific fertility rates. The coefficients for the individual cohorts (often called cohort effects) then indicate to what extent the fertility level specific to a cohort is shifted up or down after considering the effects of age and period. Age is considered because it is the basic covariate of human fertility which tends to show a rather stable pattern. The effect of period finally indicates to what extent the average fertility in a calendar year is shifted up or down as compared to the pattern implied by age and cohort effects. We will use this effect as the key to evaluate the period effect of the 1976 population policy measures.

Since we are not interested in the yearly fluctuations in period fertility levels the period dummy variables were defined for certain groups of years only that should bring out the effect of the 1976 changes best (referred to as grouped period dummies).² The years 1964-1971 are considered as pre-policy period; 1972-1976 is a period of low fertility following the 1972 liberalization of abortion; 1977 to 1981 are considered as individual years because we are interested in the short-term pattern of period effects of the 1976 measures; finally, the time since 1982 is considered one period. These groupings are clearly visible in Figure 2 which plots the estimated period effects.

The model as described above was estimated for all births between ages 18 and 30 and for births of orders one to three separately.³ The period effects plotted in Figure 2 give the effects relative to the initial period 1964-1971. For total fertility we clearly see the negative effect of the liberalization of abortion followed by the positive effect of the 1976 package. After 1981 the period effect is somewhat lower again but still higher than in 1972-1976.

Given the estimated age effects (see Figure 3) and cohort effects one can recalculate the total fertility rates using the estimated period effects and alternatively assuming the period effects to be constant at the level before the policy measures in 1976. The result is shown in Figure 4 and in numerical form in Table 1.

Because of declining cohort effects the total fertility in case of a constant period effect would not be constant but would decline after 1980. A comparison between the two reconstructed curves, one considering the positive period effects following the policy measures and the other assuming a constant low period effect, may be used to quantitatively assess the effect on period fertility of the 1976 policy package. This assumes that the es-

²For comparative reasons a model with complete period dummies has been also specified and estimated. Although it was not our main goal to find best fits of the observed complete age-specific fertility it should be mentioned that the models with complete period dummies replicate the observed time series very well. See results for TFR and parity total given in Table 1.

³Data were given for births by years of birth of the mother and parity for every period between 1964 and 1987 and for female population at the end of the respective calendar year. To solve the well known data caused identification problems within the APC-context, pseudo double-classified birth data were calculated by assuming uniform distribution of birth events over an interval (see Willekens and Baydar 1984). Then, with estimated appropriate person years, double-classified occurrence/exposure rates have been calculated. The parameters of the APC-model have been estimated by using the Generalised Linear Interactive Modelling system (GLIM), with a logarithmic link function and a poisson error structure.

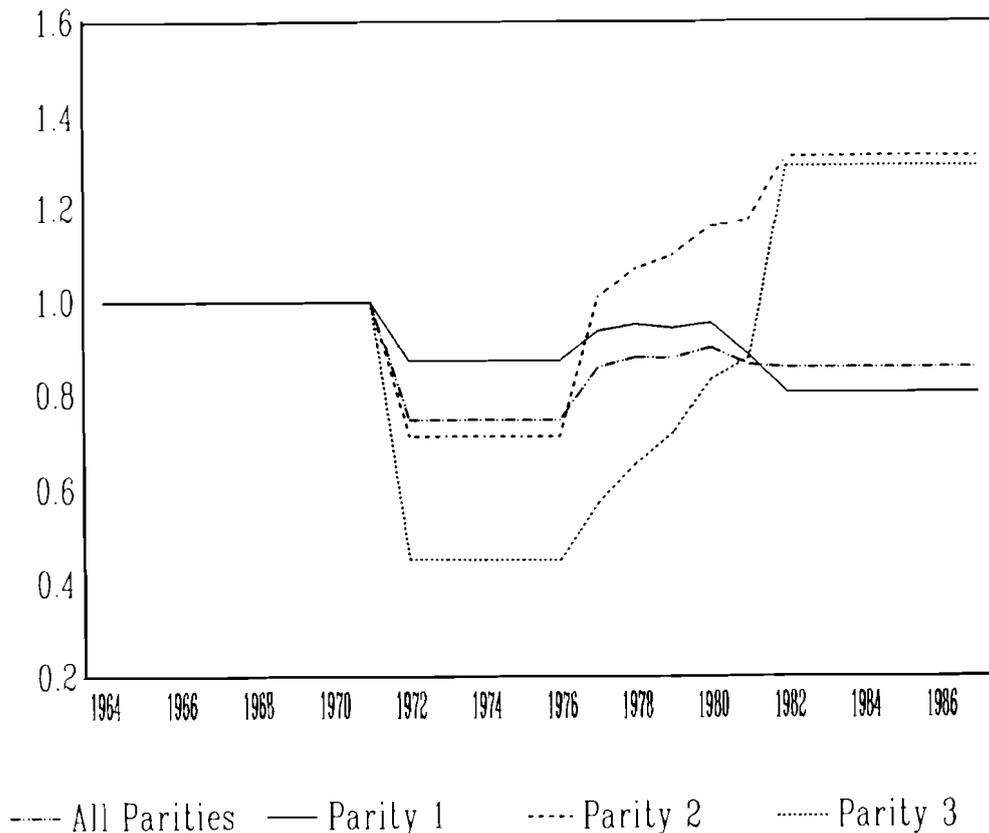


Figure 2. Relative period effects, by parity (multiplicative parameters of APC-model).

timated cohort effects stand for the fertility trend that "would have happened anyhow".

A comparison of columns 3 and 4 in Table 1 indicates that in 1980 the difference between the two constructed total fertility rates was at a maximum. In that year the additional period effect that we assume to be attributable to the policy measures of 1976 brings the TFR up by 20%. This peak was followed by a decrease to about 115%, which means that at the end of the period under consideration the TFR still showed a positive effect. If one is willing to make the assumptions indicated here, this is a numerical estimate of the fertility increasing effect of the 1976 policy measures for the five years to follow their implementation.

These results are not far from those given by Höhn and Schubnell (1986), who report for the same period an average effect of about 10%. Note that the period 1982 until 1987 shows also a positive effect as compared with 1976, but this is not attributable to the package of 1976 solely because of the measures issued in that following period.

How such period effects relate to changes in cohort fertility will be considered in the discussion section below.

It is also interesting to study the phenomenon separately for different orders of birth. As we can see from Figure 3 the underlying age patterns are quite distinct for different orders with the first birth being concentrated around ages 19 and 20, while second births peak around ages 23 and 24, and third births around age 25. In Figure 4 all age effects are expressed in relation not to the first age but to age 21, the mode of the age curve referring

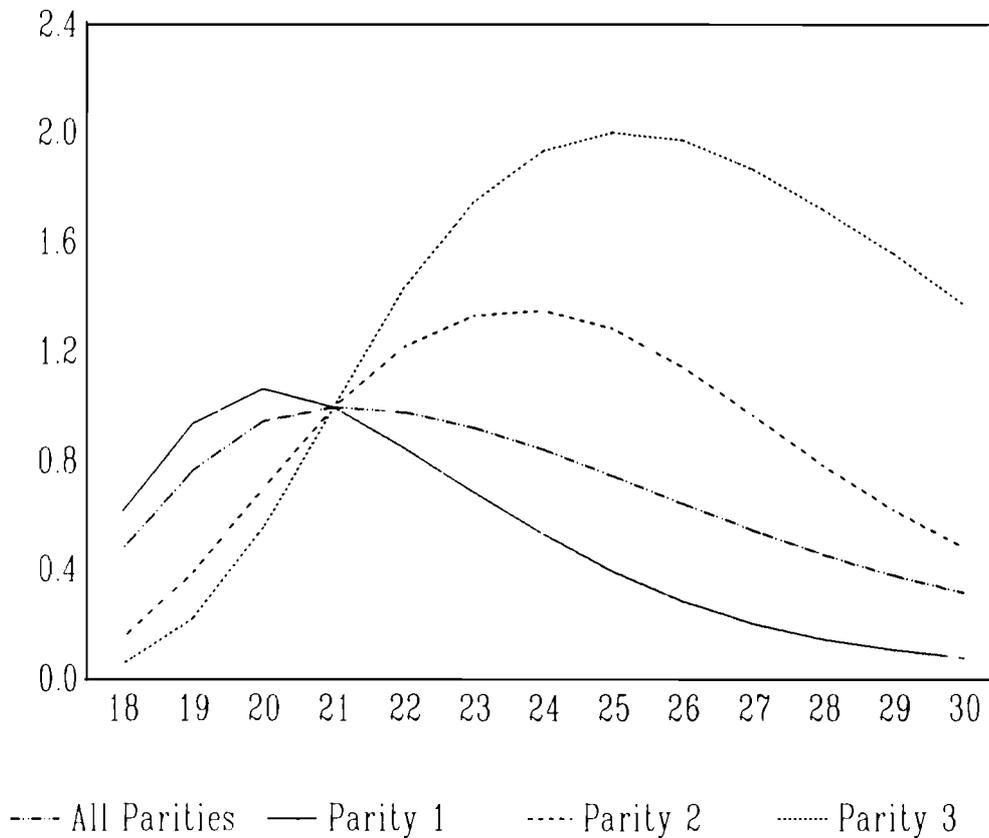


Figure 3. Relative age effects, by parity (multiplicative parameters, age 21 set to 1.0).

to births of all orders.

Concerning the period effects (see Figure 2) the general picture is quite similar for all orders: a steep decline in 1972 followed by a recovery after 1976. But the extent of the period effects is different for the various birth orders. For births of order one the decline in 1972 was least and the level of the period effect after the years of recovery is lower than in the 1972-1976 period. For second births the pattern of decline is close to that of total fertility but the increase is much stronger. For third births the depressing period effect in 1972 was by far the strongest but the recovery after 1976 was also substantial. The appearing order-specific pattern of period effects is plausible. It is very likely that a liberalization of abortion laws affects higher order births to a much greater extent than first births. The increase after 1976 also confirms to the intention of the population policy package that explicitly focused at births of orders two and above. The high level of the period effect for higher birth orders in recent years might in part reflect a decrease in the age of childbearing over the period, since in this model we consider only fertility up to age 30.

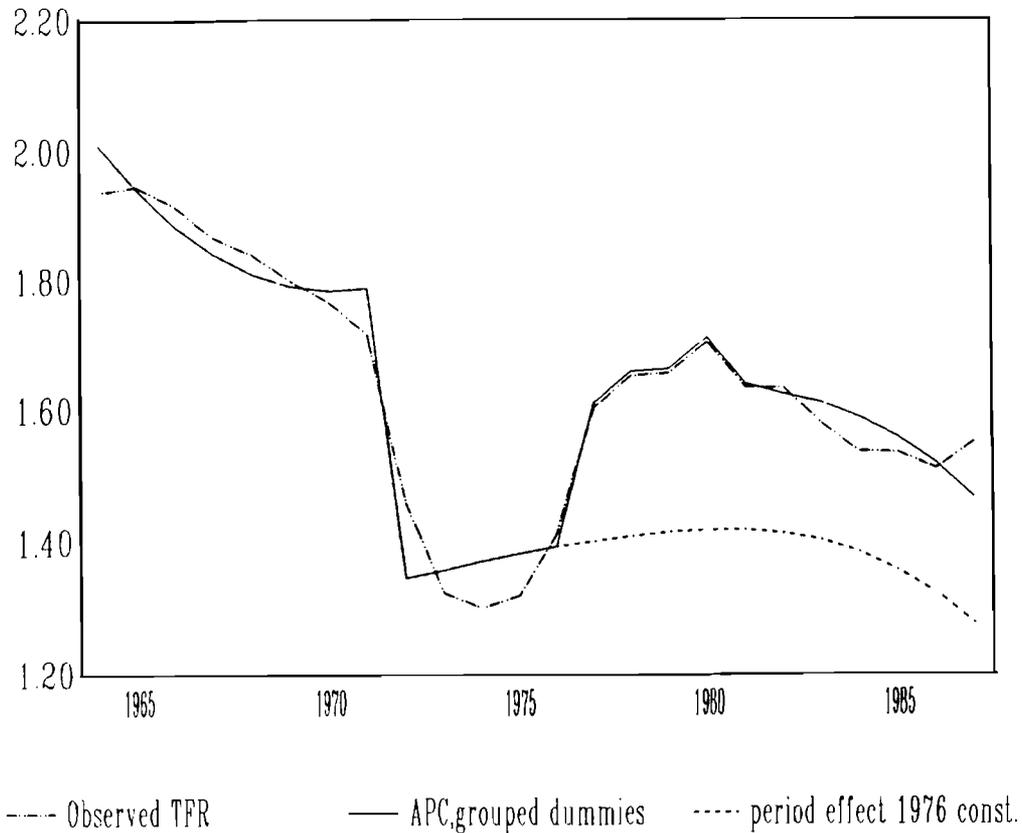


Figure 4. Total fertility rates 1964–1987, observed and APC estimates.

5. Discussion

First a word of caution is needed concerning the usage of the notions "age, period, and cohort effects". Hobcraft, Menken, and Preston (1982) stress that this terminology in the context of APC-modeling is an unfortunate one. There is no doubt that period and cohort as indicators for different time scales do not have any direct effects on demographic phenomena; they rather stand for the possible influence of social, economic, or other factors at certain points in time. Hence in our context we cannot consider them as determinants but rather as covariates of fertility. Consequently there is no way to determine to what extent the period effects since 1977 actually reflect the effect of the policy package of 1976. We just had to make the not implausible assumption that it is the dominating factor. In other countries with a less pronounced timing of policy measures this approach is hardly applicable.

The model described in this note was designed in a way to study the short-term period effects of the policy while taking cohort effects as the point of reference. The estimated cohort effects tend to be very stable over time. The cohorts born 1947 to 1953 show a slight increase while the subsequent cohorts indicate some decrease. But again, for more recent cohorts the fertility experience is still incomplete since we have only data for 12 years following the introduction of the policy measures. Hence, the estimation of another model intended to measure the effect of policies on cohort fertility would at least have to wait some more years, aside from the problem that for cohorts it is not clear when the new effects should be assumed to exert influence because after its introduction

Table 1. Comparison of total fertility rates, observed, APC-models (women aged 18 to 30).

Year	estimates				
	observed	completed period dummies	grouped period dummies	period effects 1977-1987 constant	
				effects	percentage of (3)
(1)	(2)	(3)	(4)	(5)	
1964	1.8984	1.9391	2.0090	2.0090	100.00%
1965	1.9364	1.9467	1.9431	1.9431	100.00%
1966	1.9096	1.9170	1.8862	1.8862	100.00%
1967	1.8635	1.8682	1.8432	1.8432	100.00%
1968	1.8475	1.8418	1.8119	1.8119	100.00%
1969	1.8121	1.8020	1.7931	1.7931	100.00%
1970	1.7819	1.7688	1.7861	1.7861	100.00%
1971	1.7295	1.7188	1.7896	1.7896	100.00%
1972	1.4720	1.4616	1.3475	1.3475	100.00%
1973	1.3315	1.3256	1.3595	1.3595	100.00%
1974	1.3079	1.3030	1.3728	1.3728	100.00%
1975	1.3252	1.3216	1.3847	1.3847	100.00%
1976	1.4198	1.4149	1.3953	1.3953	100.00%
1977	1.6142	1.6061	1.6130	1.4039	114.89%
1978	1.6607	1.6540	1.6609	1.4110	117.70%
1979	1.6631	1.6580	1.6648	1.4169	117.49%
1980	1.7088	1.7057	1.7123	1.4203	120.56%
1981	1.6340	1.6360	1.6421	1.4203	115.62%
1982	1.6324	1.6350	1.6255	1.4157	114.82%
1983	1.5750	1.5810	1.6125	1.4044	114.82%
1984	1.5259	1.5380	1.5908	1.3855	114.82%
1985	1.5219	1.5362	1.5601	1.3587	114.82%
1986	1.4921	1.5118	1.5209	1.3246	114.82%
1987	1.5225	1.5519	1.4683	1.2787	114.82%

the effect cuts across all cohorts.⁴ That is why in our model we assumed the period effect to be the explanandum and the cohort effect the point of reference.

Should we actually talk about a real fertility increasing effect of the policy measures introduced in 1976 when we cannot say anything about changing cohort behavior? Was this not just a short-term change in the timing of births without any lasting effect? The

⁴On the other hand, concerning cohort effects due to fertility relevant period measures/events the APC-approach may have its implicit limitations. It is in the nature of cohort effect that it is not addressable to one distinct event in time or even a couple of years within the complete cohort biography. Because it is often seen as a effect expressing the impact of events and conditions the cohort experienced before entering the fertile life span (Willekens and Baydar 1984, pp. 42-44), the calculated cohort effect may not be linked to the policy measures under consideration. In the given context, it may be viewed as an extra service to stabilize the fertility, caused by some environmental conditions long before the measures come into existence. It should be added, however, that the interpretation of cohort effect remains unsatisfactory and raises some difficulties in interpreting the parameters associated with the very first and very last age groups.

empirical facts are that after the introduction of the policy fertility rates for the following 4-5 years increased strongly at all ages. This was associated only with a very minor decrease in mean ages at births of orders 1 and 2 and with even a slight increase at births of order 3. After 1980 fertility rates again decline somewhat and so does the estimated period effect but the level is clearly higher than that during the years 1972 to 1976. Over that period mean ages at birth increase slightly for all orders. The relative stability or even slight increase of order-specific mean ages at birth indicates that the observed increases in period fertility were not just due to short-term anticipations of birth that will be missing in the future. If these measures in the longer run succeed in stopping the decline in cohort fertility has to be seen in the future.

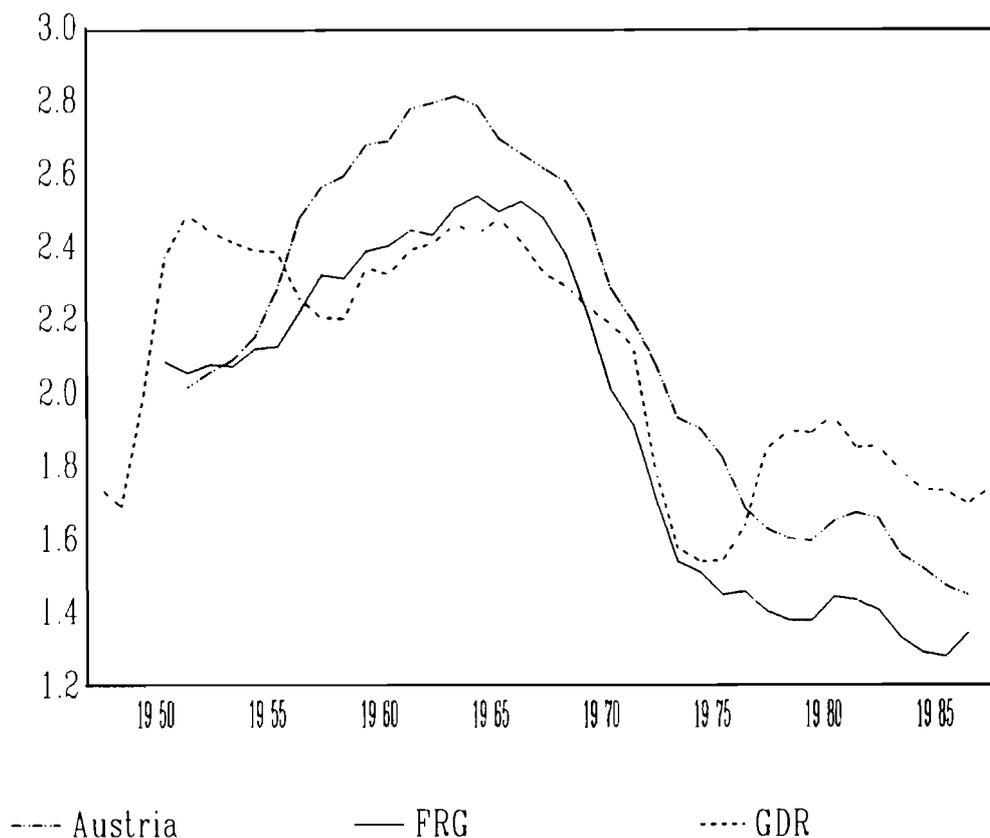


Figure 5. TFR in Austria, GDR, and FRG; calendar years 1947-1987.

A comparison to fertility trends in the other German-speaking countries, namely the Federal Republic of Germany (FRG) and Austria (Figure 5), confirms the above findings. It is amazing to see that the TFRs in the FRG and GDR show a highly similar trend at the same level between 1957 and 1972.

After 1976, however, the TFR in the GDR had consistently 0.4-0.5 more children per woman. The trend in Austria is parallel to that in the FRG at a somewhat higher level. Even if this increase in the GDR were to be a transient phenomenon, what also counts for the future age distribution is the number of births in a year and not only the pure quantum of fertility under a cohort perspective. In this sense the GDR certainly succeeded in avoiding a birth deficit after 1976 such as that in the FRG and Austria.

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